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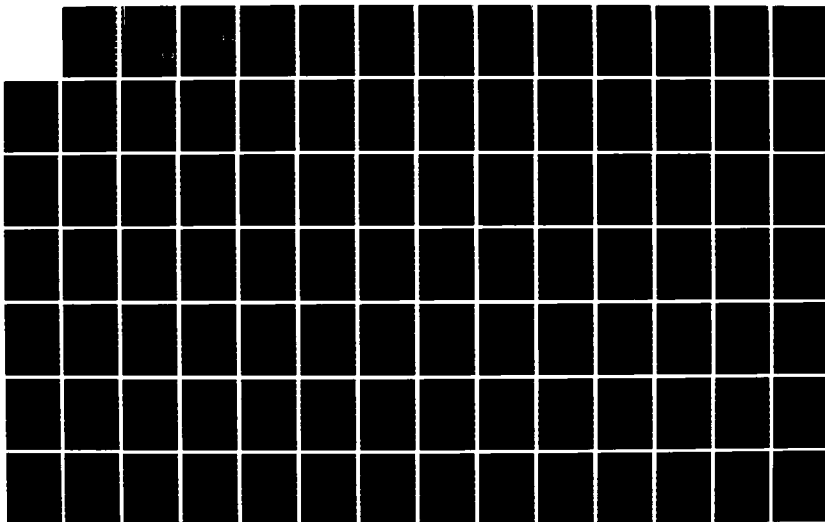
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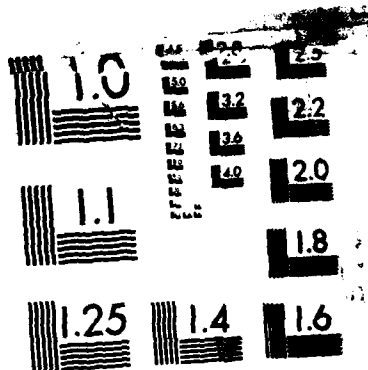
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CASUALTY
PHASE II, STAGE 1
FINAL REPORT
APPENDIX J THROUGH
APPENDIX M

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Problem confirmation study was performed at Castle AFB and included 21 potential contaminant source sites identified in the Phase I Report as requiring field investigation. The potential source sites were grouped into 16 investigation sites including the area of a plume of TCE contamination in groundwater. The field investigations, conducted from October 1984 to April 1985 included installation of 27 new monitor wells and 11 shallow piezometers, collection of sediment samples from surface soil, shallow borings, and drainage ditches, geophysical surveys of three sites, two rounds of surface and groundwater sampling and water level measurements, and pilot test operations on a Base production well. Analytes include volatile organic compounds, TOC, TOX, oil and grease, as well as phenols, nitrate, metals, pesticide and herbicides at selected sites. Of the sixteen sites investigated, twelve were recommended for further groundwater study, either through continued monitoring of existing wells, or through expansion of the monitoring network. The TCE plume in the shallow aquifer was delineated and recommended for immediate (con't. on back)

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feasibility study; additional investigation to locate the source of the plume and to define its extent in off-Base areas and in an underlying aquifer have also been recommended.

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APPENDIX J

LABORATORY QA/QC PLAN

WESTON ANALYTICAL LABORATORY QUALITY ASSURANCE PLAN
11/30/84

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1.0 INTRODUCTION

The objective of a standard quality assurance-quality control plan is to establish and delineate the minimum amount of effort the WESTON analytical laboratory will perform on every sample submitted for analysis. This plan is designed to meet four goals for the data from environmental analysis carried out by a WESTON laboratory. They are:

- Define WESTON standard of quality.
- Provide legally defensible analysis
- A published standard for comparison of price and quality
- A published standard for the purpose of building or modifying a sampling and analytical program that addresses the requirements of the project.

If project requirements necessitate different quality assurance programs, the user of WESTON analytical laboratory services is responsible for defining and identifying all deviations from the standard QA/QC plan. All changes must be documented in writing for approval by the manager of the WESTON laboratory involved.

2.0 SAMPLE HANDLING PROCEDURES

In order to meet the stated goals for the standard QA/QC plan the client and the analytical laboratory must understand and follow the rules for handling the samples within the laboratory. These rules treat the sample collector as an integral part of the laboratory team in achieving the correct analyses for the sample. Sampling handling procedures include:

- Analysis Plan
- Bottle Preparation
- Sample Preservatives
- Chain of Custody Documentation
- Sample Management System
- Sample Storage
- Analysis Scheduling
- Sample Retention and Disposal

2.1 Analysis Plan

The analysis plan is a written document that consists of the following information:

- Name of the client
- Project Director and Project Manager
- Pertinent organization information (i.e., work order numbers, name of client).
- List of parameters to be analyzed
- Number of samples listed by parameter and matrix
- Price
- Projected date and time of sample arrival at the laboratory
- List of all exceptions to the Standard Analytical Plan and the Standard QA/QC Plan*
- List all the extra considerations not included in the Standard QA/QC Plan (i.e., field blanks, USATHAMA QA/QC, specific data reporting requirements).

The analysis plan must be a written document. It must be submitted to the analytical laboratory to be approved by the manager before the samples are collected. All deviations to the analysis plan must be documented in writing by either the client or the laboratory. This document must be approv-

* The Standard Analytical Plan consists of the specific methodology used by the analytical laboratory for a given parameter and matrix. This document includes a brief description of the method, an estimated detection limit, and a source reference for the method.

ed by the laboratory and project manager within the holding time of the parameter of concern or 48 hours, which ever is less. No analysis will be performed in a WESTON analytical laboratory without the proper and complete analysis plan on file.

2.2 Bottle Preparation

Sample bottles will be prepared by the analytical laboratory and made available to the sampling team on the required date in the analysis plan. The bottles will be prepared according to WESTON Standard Operating Procedures. If samples are submitted to the laboratory in bottles or containers prepared by others, this deviation must be specified in the analysis plan along with the sample bottle preparation protocols employed and the person/company responsible for preparing the bottles.

2.3 Sample Preservatives

All sample bottles prepared by the analytical laboratory will contain the preservative(s) shown the WESTON Analysis Plan. The amount of the preservative placed in the sample bottle for aqueous samples will be adequate and proper for water samples. To ensure that a sample is properly preserved after collection (especially where preservation requires pH adjustment), field personnel are urged to check the pH of the sample after preservation. These data should be recorded in field notebooks.

All samples submitted will be checked to insure the proper preservative and preservation procedures were used for the sample. This includes the following checks where appropriate:

I Normal

- pH
- Temperature of 4°C

II Special at Discretion of Lab

- Color
- Observation of sample for particulates or air bubbles (VOA).
- Anion spot test for SO_4^{--} and Cl^- (TOC)

All observations will be recorded by laboratory personnel and no sample will be analyzed unless;

- it is properly preserved
- the client has authorized the sample analysis by a written amendment to the analysis plan or WESTON Standard QA/QC plan as prescribed in Section 2.1

2.4 Chain of Custody Documentation

All samples must arrive at the laboratory with a chain of custody document. A copy of the chain of custody document is contained in the "Tracking System". The laboratory will provide EPA-approved sample bottle labels, chain of custody forms, and shipping containers upon request. The chain of custody document must be initiated at the time the sample bottles are prepared. If the sample bottles are not prepared by the analytical laboratory then the client assumes responsibility for proper bottle selection and preparation. The chain of custody document submitted in this case should include the bottle preparation and sample preservation information.

When samples are delivered to the laboratory, the information on the chain of custody document must be complete in full. The samples will be inventoried against the chain of custody form, and custody transfer acknowledged by signature, date and time of receipt. A copy of the signed form will be given to the personnel who delivered the samples.

For samples which are delivered without applicable or with incomplete chain of custody documentation, the sample custodian will initiate a chain of custody or note acknowledges receipt of the samples and initiates laboratory custody.

FOR SAMPLES WHICH ARE RECEIVED WITHOUT PROPER CHAIN OF CUSTODY, OR DEFICIENT CHAIN OF CUSTODY, THE LEGAL TRACEABILITY OF SAMPLES BEGINS WITH RECEIPT AT THE LABORATORY BUT DOES NOT EXTEND TO THE POINT OF SAMPLE COLLECTION.

2.5 Sample Management System

Upon arrival at the laboratory, the sample will be either logged-in immediately or stored at 4°C until log-in procedures can be initiated. The log-in process for any given shipment of samples must be completed within 24 hours of sample arrival at the laboratory as noted on the chain of custody document. The log in data will be available to the submitter (Project Manager) within 48 hours after arrival of the samples at the laboratory to verify completeness of the sample submittal. Deviations from the analysis plan must be noted and resolved by both parties at this time.

The sample management system will be used for the following laboratory functions:

- Scheduling
- Sample Disposal
- Invoicing (See Pricing Schedule for the appropriate analytical laboratory)
- Data Management
- Deliverable Preparation

It is imperative that the field documentation provided by field personnel and the sample log-in procedure in the analytical laboratory be complete and accurate. Resolution of deviations from the analysis plan must be accomplished within the holding time of the parameter of concern or 48 hours. Resolution of these items must be accomplished by telephone, followed by written documentation in order to complete the analysis within the required holding time. The holding times are summarized in the Analysis Plan.

Each sample container is assigned a sequential WESTON sample number. This unique WESTON number will identify the sample (and any extracts derived from the sample) in the laboratory's internal chain of custody* until proper disposal of samples or extracts. All references to a sample in any communications should include this sample number as well as the site identification number (code).

For additional information see WESTON's Analytical Laboratory's Sample Tracking Document.

This program provides "cradle to grave" chain of custody documentation.

2.6 Sample Storage

All samples will be stored in a locked refrigerator at $4^{\circ}\pm 1^{\circ}\text{C}$. Temperature of storage refrigerators are monitored daily by laboratory personnel. They will be removed from storage by a limited number of authorized WESTON personnel for either analysis, long term retention or disposal. All sample movement will be documented using the laboratory

* WESTON's chain of custody program includes the following:

- Sample bottle preparation
- Sample preservatives
- EPA-approved sample bottle labels and chain of custody documents
- Secured shipping containers
- Laboratory access limited to authorized personnel
- Locked refrigerated storage
- Internal laboratory chain of custody documentation for all analytical operation, including sample disposal.
- All chain of custody documentation includes the location, persons involved, date, time and reason for sample dislocation.
- Signing and dating of all laboratory documentation pertaining to sample receipt, preparation and analysis.

chain of custody documentation. Sample extracts or digested samples will receive the same consideration. During non-working hours, no sample will remain unattended without being placed in a secure area.

2.7 Sample Retention and Disposal

All samples will be retained in the refrigerator for 30 calendar days after the date on the invoice accompanying the final analytical results. Unless there is a written request for sample retention in the analysis plan or a written amendment to the analysis plan, then all samples will receive proper disposal on the 31st calendar day after the invoice date. (See Price List for retention and disposal costs).

3.0 STANDARD OPERATING PROCEDURES

3.1 Analytical Methods

All of the analytical laboratory's methods are listed in the Standard Analysis Plan. Since the choice of method depends on the parameter, the matrix, possible interferences, cost, and detection limit desired, the Standard Analysis Plan denotes the method that will be used by the analytical laboratory unless the analysis plan specifically states that another method must be used. A rationale should accompany this choice of method in the analysis plan.

3.2 Documentation of the Analytical Procedure

All data and observations will be recorded into a bound laboratory notebook. The entries will include:

- Analyst
- Date, Starting and Completion times
- Calibration Data
- Results of analysis of laboratory quality control samples
- Order of Analysis
- Example calculations
- Method reference
- Instrument identification
- Location of raw and final data

All deviation from the method and pertinent observations will be recorded in the laboratory notebook and noted in the data summary report. Also, all "out of control" situations observed by the quality control program must be documented in the notebook. This includes all corrective actions taken by the analyst, supervisor, and/or the laboratory QA/QC coordinator in response to the "out of Control" situation.

4.0 ANALYTICAL LABORATORY QUALITY CONTROL

4.1 Analytical Method Calibration

4.1.1 Initial Calibration

For all parameters utilizing a calibration curve for quantification, the analytical laboratory will measure the response to a reagent blank and at least five (5) different concentrations of the analyte. A modification of the method of Hubaux and Vos will be used to determine the following:

- The acceptable linear concentration range for quantitation (the correlation coefficient (R) must be > 0.996).
- The instrumental detection limit.

At least three (3) calibration concentrations must be in the range of responses that is above the calculated detection limit and used for calculating the acceptable linear concentration range. No response can be reported for a sample if the response is:

- greater than the response of the most concentrated calibration standard used in calculating the acceptable linear concentration range.
- less than the response of the calculated detection limit.
- less than the response of the lowest concentration calibration standard if the response of the calculated detection limit is less than the response of the lowest calibration standard used.

4.1.2 Shift Calibration

Since the objective of the QC program is to verify that analytical accuracy and precision are in control for a given method - instrument - parameter, the initial instrument calibration must be verified periodically. This requires the analysis of at least one calibration standard within the range of initial calibration. The

* Analytical Chemistry, Vol. 42, No. 8, July 1970, p. 849

ongoing calibration data will be checked to verify that it is within $\pm 10\%$ of the initial calibration. A minimum of one shift calibration every 8-12 hours if the instrumental systems is automated for continuous operation.

4.1.3 Re-calibration

Recalibration is required after:

- Instrument repair and/or maintenance.
- A shift calibration does not meet previous calibration criteria.
- Any "out of control" situation as defined in Section 4.6.

4.2 Lot Size

The quality control samples are assigned to each lot of analytical samples. The size of a lot can be dictated by the number of samples that can be completed in a shift by an analyst. Therefore, the size of a lot can vary, but, the variance should not be more than 20%.

4.3 Quality Control Samples

Every lot, regardless of size, will have the following quality control samples included.

- Blanks
- Calibration Standards
- Duplicate (Split Sample)
- Spike (Standard Matrix spike)

Note: That if a lot contains 20 samples, at least one of the samples will be analyzed in duplicate. If a client submits less than 20 samples for analysis and desires one of those samples be analyzed in duplicate, the laboratory must be notified prior to sample receipt.

4.3.1 Quality Control Blanks

4.3.1.1 Reagent Blank

The reagent blank is an integral part of the calibration procedure. It consists of the solvent or matrix used for the calibration standards without the presence of the analyte being measured.

The analytical laboratory will use solvents and reagents of the highest purity available to minimize laboratory contamination. Also, the water quality of the deionized - carbon treated "pure" water system will be monitored monthly.

4.3.1.2 Method Blank

The method blank is a matrix as similar to that of the analytical sample as possible without the presence of the analyte. The method blank is prepared and analyzed with the samples and is used to monitor laboratory contamination.

4.3.2 Analytical Reference Standards

Calibration and spiking standards will be traceable standard materials supplied by or traceable where possible to a federal government agency such as EPA, NBS, or USATHAMA. Where this is not possible, analytical standards of highest available purity will be purchased from available commercial suppliers.

4.3.2.1 Calibration Check Standard

When the analyses a lot of analytical samples along with the required QC samples are complete, a check calibration standard will be analyzed. A check calibration standard is one of the calibration standard solutions used to develop the analytical calibration. This calibration standard must be in the acceptable linear concentration range of the calibration curve. Acceptability of the response to calibration check standard is determined by the QC chart as discussed in sections 4.4 and 4.6.

4.3.3 Standard Matrix Spike Sample

In each analytical sample lot one sample will be a standard matrix spike consisting of a matrix as similar as possible to the matrix of the analytical samples in the lot. The analyst will spike one of these with a known amount of the analyte with the acceptable calibration concentration range. The standard matrix spike sample is carried through the method as an analytical sample. In most cases laboratory reagent water and/or a "clean" soil will be used for the matrix. The results of this spike sample will be used to monitor analytical accuracy.

4.3.4 Quality Control Sample Summary

Assuming that the analytical lot size for a parameter is twenty (20), the analyst would follow the hypothetical analysis order shown in Table 1.

4.4 Quality Control Charts

Three QC charts will be constructed for each analytical method (instrument - parameter) excluding the analyst. The analyst will have his or her own code on the QC chart. The QC charts are:

- An accuracy QC chart based on the % recovery of the standard matrix spike sample.
- A precision QC chart based on the relative mean difference between the results obtained from the analysis of duplicate sample aliquots.
- A precision QC chart based on the reproducibility of the initial and shift calibration slope.
- A Quality Control chart for monitoring ongoing calibration.

The details of the QC chart construction with examples are contained in the WESTON Analytical Laboratory Quality Assurance - Quality Control Manual.

4.5 Quality Control for Reporting Results

4.5.1 Detection Limit

There are three detection limits derived from the method and the analytical experiment.

- Estimated detection limit.
- Detection limit calculated from the calibration data.
- The lowest concentration of the analyte in any calibration standards.

None of the above detection limits applies to a real environmental matrix for the analyte of concern. In most cases the actual detection limit will be equal to or greater than the instrumental detection limit which is reported. Upon request, the actual detection limit for a given matrix can be experimentally determined or estimated.

Table 1

Hypothetical Order of Analysis for a Lot
Size of 20 Analytical Samples

<u>Run #</u>	<u>Description</u>	<u>Comments</u>
1	Reagent Blank	Shift Calibration
2	Standard #1	Shift Calibration
3	Standard #2	Shift Calibration
4	Standard #3	Shift Calibration
5-11	Analytical Samples #1-7	
12	Duplicate of Analytical Sample #5	QC Sample
13-16	Analytical Samples #8-11	
17	Standard Matrix Spike	QC Sample
18-24	Analytical Samples #12-18	
25	Method Blank	QC Sample
26-27	Analytical Samples #19-20	
28	Calibration Check Sample	QC Sample

Notes: (a) A new lot can be analysed without a shift calibration if there are no "out of control" situations and the analyst remains the same. (i.e. return to run #5 and continue through run #28)

(b) Four (4) QC samples are required per lot of 20. This is 16 2/3% of the runs.

The analytical laboratory will report experimentally observed detection limit from the calibration data. The latter concentration will be the higher concentration value of either the value obtained from the calibration for regression analysis or the lowest concentration calibration standard run.

4.5.2 Significant Figures

The general rule for the application of significant figures to analytical environmental data is shown in Table 2.

4.5.3 Units

A few environment analytical parameters have their own respective units such as pH, specific conductivity and turbidity. Most concentrations will be reported in one of two units. Concentrations for liquid samples will be reported in micrograms per liter (ug/L or ppb). Concentrations for solid samples will be reported as micrograms per kilogram (ug/Kg/ppg) dry weight. Any deviation from this reporting format will appear in a footnote form.

4.5.4 Analytical Modifications

All changes and rationale for the changes from the published WESTON Standard Analysis Plan, WESTON Standard QA/QC Plan and the project's analysis plan will be placed into a cover letter/report to the client accompanying the final results and invoice.

4.5.5 Final Data Review

All analytical laboratory results will be reviewed by the laboratory technical managers for the following items:

- Completeness
- Reasonableness
- Conformance with the WESTON Standard Analytical Plan, WESTON Standard QA/QC Plan and the project's analysis plan.
- Data above a regulatory limit, where appropriate.
- Approval of the data by appropriate Section Manager.

Table 2

Relationship of the Experimentally Found Detection Limit, Analyte Concentration and Significant Figures in the Final Result

<u>Detection Limit</u>	<u>Concentration Range</u>	<u># of Significant Figures</u>
1	1 - 10	1
1	10 - 1000	2
1	1000	3

Example: Detection Limit of 100 ug/Kg

<u>Concentration Found</u>	<u>Concentration Reported</u>
84.3 ug/Kg	ND
436.2 ug/Kg	400. ug/Kg
2178.6 ug/Kg	2200. ug/Kg
654266.5 ug/Kg	654000. ug/Kg

4.5.6 Deliverables

The client will receive the following when the analyses have been completed by the laboratory.

- Analytical Data including instrumental detection limits.
- Assurance that the WESTON Standard Analytical Plan, WESTON Standard QA/QC Plan and the project's analysis plan were followed.
- Assurance that all quality control samples were in control.
- A cover letter.
- Invoice

The client will not receive the following unless specifically requested in writing (preferably in the analysis plan):

- Raw data
- QC sample results (except for surrogate recoveries for GC/MS analyses.)
- Pertinent QC charts
- EPA, USATHAMA or other specialized data reports.

4.5.7 Data Archiving

The analytical laboratory will maintain on file, all the raw data, laboratory notebooks, and other documentation pertinent to the work on a given project. This file will be maintained in locked storage for five (5) years from the date of the invoice unless a written request is submitted for changes the retention time.

Data Retrieval from archives will be handled in a similar fashion to a request for analysis; specifically a written request, chain of custody, quotation, three week turn-around time, etc.

4.6 Out of Control Situations

An "out of control" situation occurs when there are experimental data for laboratory quality control samples which suggest that an analytical result may be of questionable or unknown validity. It is the duty of the analyst to identify the "out of control" situation and notify the supervisor. The supervisor will then recommend the appropriate corrective action. (e.g. reanalysis, recalibration, etc.). The out of control situation and corrective action will be documented. The analysis of QC sam-

ples monitors precision, accuracy and laboratory contamination for a particular analysis. The criteria for identifying out of control situations for laboratory QC samples are discussed below:

4.6.1 Blanks

Any reagent or method blank which contains any analyte greater than five (5) times the published detection limit for the method - instrument - parameter analytical system is "out of control". Corrective action is required.

4.6.2 Duplicate Samples and Fortified Reagent Blanks (Standard Matrix Spike)

Any result from a split sample or a fortified reagent blank that fulfills the following criteria for "out of control" on the respective QC chart (See the QA Manual) method/parameter requires corrective action and/or written explanation for the acceptance of the data without any corrective action.

- Any result that exceeds ± 3 standard deviation of the control value.
- The 5th consecutive value that has shown an increasing or decreasing trend.
- The 7th consecutive value on the same side of the central line (mean).

The results from analysis of duplicate samples can be misleading where matrix homogeneity is a problem (e.g. soil, sludges, sediments, multiphase liquid samples) because of the difficulty in obtaining replicate representative aliquots for analysis.

In these cases a written explanation (cover letter) will be provided for data interpretation.

4.6.3 Calibration Check Standard

Any calibration check standard that fulfills the criteria for "out of control" on the QC chart as delineated in section 4.6.2 requires corrective action.

4.6.4 Sample Cross Contamination or Interference

Any sample where there is any suspected cross contamination from the previously analyzed sample must be regarded as "out of control". Cross contamination

tion usually occurs after analysis of sample with relatively high concentrations of analytes or interfering compounds. Therefore, the analyst must be aware of such occurrences. To verify the result, the sample must be reanalyzed immediately after an acceptable blank run and the data for the reanalysis compared with the original. Data will be carefully reviewed (e.g. order of analysis, historical data) by analysts and supervisors to ensure that the data accurately represents the sample. (see section 4.5.5)

4.6.5 Instrument Malfunction

Any instrument malfunction is considered as a situation that necessitates corrective action (see section 4.7). Written documentation of the malfunction and corrective action is mandatory (see section 4.8).

4.7 Corrective Action

All "out of control" situations require immediate attention and corrective action. This corrective action will be as follows:

- The analyst will immediately notify the appropriate supervisor and document the out of control situation in the laboratory notebook.
- The supervisor will notify, in writing, the laboratory manager within 24 hours of the "out of control" situation, corrective action taken and result of corrective action. A copy will be provided to the laboratory QA coordinator.
- The laboratory manager will notify the WESTON Analytics office of any "out of control" situations that have not been corrected within 48 hours of their occurrence. A copy will be sent to the Vice President of Quality Assurance and Finance and the Vice President of EEOD. A written report on the corrective is required when the analyses are in control.

Corrective action requires the following steps:

- Analyses to be stopped immediately for the analyte which is determined "out of control". No further analyses for that analyte can be performed until the "out of control" situation is corrected.
- Notification as shown above.

- Complete documentation in laboratory notebooks of circumstances pertaining to the "out of control" situation and corrective action(s) taken.

The laboratory manager must initial the documentation of the successful corrective action after its completion and must approve resumption of analysis. All of the samples affected by the "out of control" situation must be reanalyzed. Data for any samples of an affected lot which are not reanalyzed must be accompanied by clarification for this decision.

4.8 Instrument Maintenance and Calibration

Each instrument in the analytical laboratory will have a bound maintenance log for documenting instrument maintenance. This maintenance log will be available near the instrument at all times and will be kept current.

4.8.1 Maintenance Information

The following maintenance information is required to be recorded in the maintenance log.

- Detailed statement of maintenance activities including time and date of maintenance and name of person performing maintenance.
- Any telephone call regarding service/maintenance (phone records) and service reports will maintained in the maintenance log.
- Routine maintenance schedule should appear with a check list in the front of the maintenance log.

Instrument Manuals should be maintained in a central file and should be available as necessary.

4.8.2 Calibration Information*

The following instrument calibration information should be recorded in the laboratory notebook (see Sec. 4.1).

* Calibration of some laboratory instruments such as a pH meter, is inconsistent with calibration criteria described in Section 4.1. These instruments will have specific SOPs written for calibration. The instruments which are included in this category are so noted in the WESTON Analytical Laboratory QA/QC Manual.

- Instrumental conditions which are used.
- Time and date.
- Lot(s) to be analyzed
- Calibration data including slope of calibration line and; correlation coefficient of calibration data (response vs concentration).
- The detection limit- (calculated from the calibration data or the lowest concentration calibration standard).
- The acceptable linear concentration range of calibration.

5.0 QUALITY ASSURANCE

5.1 Organization

The corporate quality assurance function is defined in the Corporate OP-03-07. The analytical laboratory portion of the QA organization is shown in Figure 1. This organization is specifically designed to allow independent audit of the laboratory analytical operations. There are no administrative supervisory relationships between the laboratory management and WESTON Analytics, including the laboratory QA coordinator.

5.2 Responsibilities of the QA Organization

5.2.1 Internal Audits

Continuous audit of the analytical laboratory will be performed in order to ascertain and ensure compliance with the WESTON Standard QA/QC Plan, WESTON Standard Analytical Plan, the WESTON analytical laboratory QA/QC Manual and project analysis plans.

5.2.2 Third Party Audits

Arranging for and scheduling third party audits will be the responsibility of the QA coordinator and laboratory manager. This will include:

- Preparation of the analysis plan for all third party performance samples.
- Review all the results and documentation for third party performance samples.
- Approve in writing all final reports and documentation for third party performance samples.

5.2.3 "Out of Control" Audits

All "out of control" events will be continuously audited.

5.2.3.1 Termination of an Analytical Procedure

The Director of QA/QC Programs has the authority after notice (see Sec. 4.7) to terminate an analytical procedure due to the lack of compliance with any single aspect of the WESTON Standard QA Plan, WESTON Standard Analytical Plan, or WESTON Analytical Laboratory QA/QC Manual.

5.2.3.2 Restart of Terminated Analytical Procedures

The Director of QA/QC Programs must approve the restart of any analytical procedures which are "out of control" and have been terminated.

5.2.4 Quality Control Sample Results

Results of analysis of all quality control samples must be reviewed and approved in writing by the laboratory QA coordinator. These samples are required by the WESTON Standard QA/QC Plan and include all third party performance samples, and all blind WESTON QC samples. As described in detail in the WESTON Analytical Laboratory QA/QC Manual the following QA samples may be required as part of a project QA program.

- Blanks
 - Reagent Blank*
 - Method Blank*
 - Trip Blank**
 - Field Blank**
- Replicates
 - Field duplicate samples (or replicate)
 - Laboratory split samples
- Spikes
 - Field spiked sample (one sample of field split-samples).
 - Laboratory matrix spiked sample.
 - Laboratory standard matrix spiked sample*.
- Performance Samples
 - Third party samples
 - WESTON "blind" samples

* Samples required by the WESTON Standard QA/QC Plan. Results of these samples will be checked on a parameter basis during routine audits unless specifically requested by the project analysis plan.

** These samples are currently not required by the standard laboratory QA/QC plan. However for specific analyses (e.g. analysis of volatile organic compounds in aqueous samples) it is important that the persons collecting the samples give strong consideration to including field and trip blanks in the samples submitted for analysis. This requirement will be addressed in the preparation of the project sampling and analysis plan.

5.2.5 Reports and Deliverables

5.2.5.1 Quarterly QA Reports

A quarterly QA report to the Director of QA/QC Programs must be prepared by WESTON Analytics by the 15th of January, April, July, and October of each year. The quarterly report will be a summary of all laboratory audit results, results from blind samples, performance samples, and project analysis plan QA samples, and "out of control" situations. Recommendations for future improvements and actions must be included in this report.

5.2.5.2 Annual QA Report

An annual QA report will be prepared by WESTON Analytics by January 15 of each year. The annual report will summarize activities and performance of the total WESTON QA system as it relates to analytical laboratories. QA/QC goals for the next year with appropriate action plans, milestones, and costs are to be included in the report.

5.2.5.3 "Out of Control" Report

The report required by Section 4.7 must be reviewed by the laboratory QA coordinator. The report with QA coordinator comments will be forwarded through WESTON analytics to the Director of QA/QC Programs.

5.2.5.4 Project QA Report (special project requirement)

If the project analysis plan requires the analysis of any QC samples(s) beyond those required by the laboratory QC plan or requires an audit of data documentation, the Laboratory Manager must perform the tasks to comply with the project's analysis plan.

5.2.5.5 Third Party Performance Sample Report

Results of analysis of third party performance samples must be reviewed by the laboratory QA coordinator and a summary report prepared, before the results can be forwarded to the third party.

5.2.5.6 A Non-Compliance Report

Any non-compliance with the WESTON QA system, plans, or protocols observed by the QA coordinator will be reported at the earliest possible time, in writing, to the laboratory manager. If the situation has been corrected within 48 hours then the written report will be filed by the QA coordinator. However, if the situation is not corrected within 48 hours then the following action is required:

- The laboratory QA coordinator and the laboratory manager must submit to QA/QC Director of Programs, a corrective action plan.

Corrective action plan shall include the following information:

- Description of the non-compliance situation.
- Detailed Action Plan
- Milestones with projected completion dates.
- Estimated cost and/or loss of revenue associated with the action plan.
- If the QA/QC Director of Programs approves the action plan, necessary action will be carried out by the laboratory manager and monitored by the QA coordinator.
- If agreement on an appropriate action plan cannot be reached, the Director of QA/QC Programs will make the final determination of the actions to be taken.

5.2.5.7 WESTON Analytical Laboratory QA/QC Manual

The laboratory technical staff, the QA Coordinator, and the Director of QA/QC Programs are responsible for reviewing the WESTON Analytical Laboratory QA/QC Manual on an annual basis. This will include the WESTON Standard QA/QC Plan and the WESTON Standard Analytical Plan.

6.0 SUBCONTRACTED ANALYSES

All subcontracted analyses will be sent to a WESTON "approved" laboratory. The criteria for the WESTON approved laboratory are:

- Evidence of required regulatory authority approval/certification as appropriate.
- WESTON Analytics on-site inspection and recommendation.
- Review and evaluation of work quality

A copy of the following documents must accompany the sample(s).

- Chain of Custody forms
- WESTON analytical laboratory services agreement including conditions and appropriate attachments
- WESTON SOP for the analytical procedures(s)

The WESTON laboratory manager is responsible for all of the required documentation that must accompany any subcontracted work. The WESTON laboratory manager or designee has the "right of first refusal" of all analytical work generated by WESTON personnel. If the work is refused, the laboratory manager will take responsibility for subcontracting the work to an acceptable laboratory and will ensure compliance with the WESTON Standard QA/QC Plan, WESTON Standard Analytical Plan, WESTON Analytical Laboratory QA/QC Manual and the WESTON project's analysis plan.

APPENDIX K

LABORATORY ANALYTICAL METHODS

CASTLE AFB

Soil Analytes and Detection Limits

<u>Analyte</u>	<u>Method</u>	<u>Detection Limit (ug/g)</u>
Endrin	Standard 509A	0.02
Lindane	Standard 509A	0.01
Methoxychlor	Standard 509A	0.20
Toxaphene	Standard 509A	1.0
2,4-D	Standard 509B	0.06
2,4,5-TP (Silvex)	Standard 509B	0.06
Oil and Grease	EPA 413.2	100.
Volatile Organic Analytes including MEK (methylethyl ketone)	EPA 601 & 602	As specified by Method
Polychlorinated Biphenyls (PCB)	EPA 608	1.0 *

* Identify PCB type, if possible

ONSTLE AFB

Water Sampling Analytical Requirements

Master List

Analytes	Method	Holding Time	Required Detection Limit	Container		Preservative
				Volume	Type	
Volatile Organic Analytes including Methylene ketone	EPA 601	14 days	As specified by method	40 ml, Clear glass, teflon septum		None
	EPA 602	14 days		40 ml, Clear glass, teflon septum		1:1 HCl (CA req.)
Oil and Grease	EPA 413.2	28 days	100 ug/l	1000 ml, Amber glass		H ₂ SO ₄
Total Organic Carbon (TOC)	EPA 415.1	28 days	1000 ug/l	250 ml, Amber glass, teflon septum		HCl (WESTON) H ₂ SO ₄ (ORHL)
Total Organic Halogens (TOX)	EPA 9020	14 days	5 ug/l	250 ml, Amber glass, teflon septum		None
Metals (Dissolved): Cadmium Chromium Lead Mercury Silver	EPA 213.2	6 months	10 ug/l	500 ml, Plastic		Field filtered HNO ₃
	EPA 218.1	6 months	50 ug/l	500 ml, Plastic		Field filtered HNO ₃
	EPA 235.2	6 months	20 ug/l	500 ml, Plastic		Field filtered HNO ₃
	EPA 245.1	6 months	1.0 ug/l	500 ml, Plastic		Field filtered HNO ₃
	EPA 272.2	6 months	10 ug/l	500 ml, Plastic		Field filtered HNO ₃
Phenolics (total)	EPA 420.1	28 days	1 ug/l	1000 ml, Amber glass teflon-lined lid		H ₃ PO ₄ + OLSO ₄ or H ₂ SO ₄
Nitrate Ion	EPA 353.2	28 days	100 ug/l	500 ml, Plastic		H ₂ SO ₄
Pesticides Endrin Lindane Methoxychlor Toxaphene Herbicides 2,4-D 2,4,5 TP (Silvex)	Standard 509A	7 days/40 days ¹	0.02 ug/l	1000 ml, Glass, teflon-lined lid		None
	Standard 509A	7 days/40 days ¹	0.01 ug/l	1000 ml, Glass, teflon-lined lid		None
	Standard 509A	7 days/40 days ¹	0.20 ug/l	1000 ml, Glass, teflon-lined lid		None
	Standard 509A	7 days/40 days ¹	1.0 ug/l	1000 ml, Glass, teflon-lined lid		None
	Standard 509B	7 days/40 days ¹	0.06 ug/l	1000 ml, Glass, teflon-lined lid		None
	Standard 509B	7 days/40 days ¹	0.06 ug/l	1000 ml, Glass, teflon-lined lid		None

¹ Extraction/Analysis



inter-office memorandum

TO: Katherine Sheedy
cc: Alison Dunn

DATE: October 11, 1985

RECEIVED

OCT 14 1985

FROM: David Ben-Hur *DB*

GEOSCIENCES DEPT

SUBJECT: Oil and Grease Analysis, Castle AFB

W. O. No.:

Attached is a copy of EPA Method 413.2 for the determination of oil and grease in water. As I have stated earlier, the detection limits using the method as described will not meet the requirements of the Air Force.

On the second round of sampling at Castle AFB, the samples were extracted as described in the procedure up to step 7.5. An additional step was inserted at this stage:

The combined solvent extracts are transferred to Kuderna-Danish concentrator fitted with a three ball condenser. The extract is concentrated by heating on a steam bath to a final volume of about 20 ml. The concentrated extract is transferred to a 25 ml volumetric flask, and the Kuderna-Danish flask is rinsed with 2-3 ml of Preon-113. The rinsate is added to the volumetric flask, and the final volume is adjusted to 25 ml.

The remainder of the procedure follows the EPA Method.

OIL AND GREASE, TOTAL RECOVERABLE

Method 413.2 (Spectrophotometric, Infrared)

STORET NO. 00560

1. Scope and Application

- 1.1 This method includes the measurement of fluorocarbon-113 extractable matter from surface and saline waters, industrial and domestic wastes. It is applicable to the determination of hydrocarbons, vegetable oils, animal fats, waxes, soaps, greases and related matter.
- 1.2 The method is applicable to measurement of most light petroleum fuels, although loss of about half of any gasoline present during the extraction manipulations can be expected.
- 1.3 The method covers the range from 0.2 to 1000 mg/l of extractable material.
- 1.4 While this method can be used to obtain an estimate of the oil and grease that would be measured gravimetrically, in many cases the estimate more accurately describes the parameter, as it will measure volatiles more effectively and is not susceptible to interferences such as extractable sulfur. It can be used with the Petroleum Hydrocarbon procedure to obtain an oil and grease value and a petroleum hydrocarbon value on the same sample.

2. Summary of Method

- 2.1 The sample is acidified to a low pH (< 2) and extracted with fluorocarbon-113. The oil and grease is determined by comparison of the infrared absorbance of the sample extract with standards.

3. Definitions

- 3.1 The definition of oil and grease is based on the procedure used. The source of the oil and/or grease, and the presence of extractable non-oily matter will influence the material measured and interpretation of results.

4. Sampling and Storage

- 4.1 A representative sample of 1 liter volume should be collected in a glass bottle. If analysis is to be delayed for more than a few hours, the sample is preserved by the addition of 5 ml HCl (6.1) at the time of collection and refrigerated at 4°C.
- 4.2 Because losses of grease will occur on sampling equipment, the collection of a composite sample is impractical. Individual portions collected at prescribed time intervals must be analyzed separately to obtain the average concentration over an extended period.

5. Apparatus

- 5.1 Separatory funnel, 2000 ml, with Teflon stopcock.
- 5.2 Infrared spectrophotometer, scanning. Non-scanning instruments may also be used but can be subject to positive interferences in complex chemical wastewaters.
- 5.3 Cells, 10 mm, 50 mm, and 100 mm path length, sodium chloride or infrared grade glass.
- 5.4 Filter paper, Whatman No. 40, 11 cm.

Issued 1974

Editorial revision 1978

6. Reagents

- 6.1 Hydrochloric acid, 1:1. Mix equal volumes of conc. HCl and distilled water.
- 6.2 Fluorocarbon-113, (1,1,2-trichloro-1,2,2-trifluoroethane), b. p. 48°C.
- 6.3 Sodium sulfate, anhydrous crystal.
- 6.4 Calibration mixtures:
 - 6.4.1 Reference oil: Pipet 15.0 ml n-hexadecane, 15.0 ml isooctane, and 10.0 ml chlorobenzene into a 50 ml glass stoppered bottle. Maintain the integrity of the mixture by keeping stoppered except when withdrawing aliquots.
 - 6.4.2 Stock standard: Pipet 1.0 ml reference oil (6.4.1) into a tared 200 ml volumetric flask and immediately stopper. Weigh and dilute to volume with fluorocarbon-113.
 - 6.4.3 Working standards: Pipet appropriate volumes of stock standard (6.4.2) into 100 ml volumetric flasks according to the cell pathlength to be used. Dilute to volume with fluorocarbon-113. Calculate concentration of standards from the stock standard.

7. Procedure

- 7.1 Mark the sample bottle at the water meniscus for later determination of sample volume. If the sample was not acidified at time of collection, add 5 ml hydrochloric acid (6.1) to the sample bottle. After mixing the sample, check the pH by touching pH-sensitive paper to the cap to insure that the pH is 2 or lower. Add more acid if necessary.
- 7.2 Pour the sample into a separatory funnel.
- 7.3 Add 30 ml fluorocarbon-113 (6.2) to the sample bottle and rotate the bottle to rinse the sides. Transfer the solvent into the separatory funnel. Extract by shaking vigorously for 2 minutes. Allow the layers to separate.
- 7.4 Filter the solvent layer into a 100 ml volumetric flask through a funnel containing solvent-moistened filter paper.

NOTE: An emulsion that fails to dissipate can be broken by pouring about 1 g sodium sulfate (6.3) into the filter paper cone and slowly draining the emulsion through the salt. Additional 1 g portions can be added to the cone as required.
- 7.5 Repeat (7.3 and 7.4) twice more with 30 ml portions of fresh solvent, combining all solvent in the volumetric flask.
- 7.6 Rinse the tip of the separatory funnel, filter paper, and the funnel with a total of 5–10 ml fluorocarbon-113 and collect the rinsings in the flask. Dilute the extract to 100 ml, and stopper the flask.
- 7.7 Select appropriate working standards and cell pathlength according to the following table of approximate working ranges:

<u>Pathlength</u>	<u>Range</u>
10 mm	2–40 mg
50 mm	0.4–8 mg
100 mm	0.1–4 mg

- 7.8 Scan standards and samples from 3200 cm^{-1} to 2700 cm^{-1} with fluorocarbon-113 in the reference beam and record the results on absorbance paper. The absorbances of samples

and standards are measured by constructing a straight baseline over the range of the scan and measuring the absorbance of the peak maximum at 2930 cm^{-1} and subtracting the baseline absorbance at that point. For an example of a typical oil spectrum and baseline construction, see Gruenfeld⁽³⁾. Non-scanning instruments should be operated according to manufacturer's instructions, although calibration must be performed using the standards described above (6.4). If the absorbance exceeds 0.8 for a sample, select a shorter pathlength or dilute as required.

- 7.9 Use a calibration plot of absorbance vs. mg oil prepared from the standards to determine the mg oil in the sample solution.

8. Calculation

$$8.1 \quad \text{mg/l total oil and grease} = \frac{R \times D}{V}$$

where:

R = oil in solution, determined from calibration plot, in milligrams.

D = extract dilution factor, if used.

V = volume of sample, determined by refilling sample bottle to calibration line and correcting for acid addition if necessary, in liters.

9. Precision and Accuracy

- 9.1 The two oil and grease methods in this manual were tested by a single laboratory (EMSL) on sewage. This method determined the oil and grease level in the sewage to be 17.5 mg/l. When 1 liter portions of the sewage were dosed with 14.0 mg of a mixture of #2 fuel oil and Wesson oil, the recovery was 99% with a standard deviation of ± 1.4 mg/l.

Bibliography

1. Standard Methods for the Examination of Water and Wastewater, 14th Edition, p 516, Method 502B, (1975).
2. American Petroleum Institute. "Manual on Disposal of Refinery Wastes", Vol. IV, Method 733-58 (1958).
3. Gruenfeld, M., "Extraction of Dispersed Oils from Water for Quantitative Analysis by Infrared Spectroscopy", Environ. Sci. Technol. 7, 636 (1973).

APPENDIX L
LABORATORY ANALYTICAL REPORTS

L.1 SOILS AND DITCH SEDIMENTS:
SCHEDULE OF ANALYSES AND DATA REPORTS



inter-office memorandum

TO: Fred Bopp

DATE: March 29, 1985

cc: Alison Dunn, Concord Office

FROM: David Ben-Hur, Stockton Laboratory

SUBJECT: Soil samples from Castle AFB

W. O. No.: 0628-09-02

Attached are results of analyses of soil samples from Castle AFB which were collected in October and November 1984. The results have been previously reported verbally, but not in writing.

There are some unexplainable inconsistencies in duplicate runs for oil and grease. EAL states that the samples DAL-1-1 and DAL-1-1 Dup do not appear visually to be the same. Possibly the wrong sample was extracted as a duplicate; however, the records do not show such an error.

Sampling and analysis calendar
Castle AFB

Sample No.	Date Sampled	Date Analyzed			
		601	602	Oil and Grease	Pesticides Herbicides
DA1-1-1	11/18/84	12/6	12/6	11/29 ¹	-
DA1-1-1 Dup	"	12/3	12/3	"	-
DA1-1-5	"	"	"	11/30	-
DA1-1-10	"	"	"	"	-
DA1-2-1	"	"	"	"	-
DA1-2-1 Dup	"	12/5	12/5	"	-
DA1-2-5	"	"	"	"	-
DA1-2-10	"	"	"	"	-
DA1-3-1	11/17/84	12/4	12/4	"	-
DA1-3-1 Dup	"	12/3	12/3	12/6	-
DA1-3-5	"	12/4	12/4	"	-
DA1-3-10	"	"	"	"	-
DA1-4-1	"	12/6	12/6	"	-
DA1-4-1 Dup	"	"	"	"	-
DA1-4-5	"	12/5	12/5	"	-
DA1-4-10	"	"	"	"	-
DA3-1	11/9/84	12/12	12/12	11/29	12/17
DA3-1 Dup	"	"	"	"	"
DA3-2	"	12/7	12/7	"	"
DA3-3	11/10/84	"	"	"	"
DA3-4	"	12/11	12/11	"	"
DA4-1	11/17/84	12/4	12/4	-	-
DA4-1 Dup	"	11/28	11/28	-	-
DA4-5	"	"	"	-	-
DA4-10	"	"	"	-	-
DA4-11	"	12/6	12/6	-	-
DA4-11 Dup	"	12/4	12/4	-	-
DA4-15	"	12/6	12/6	-	-
DA4-20	"	11/28	11/28	-	-

Sampling and analysis calendar
Castle AFB

Sample No.	Date Sampled	Date analyzed			
		601	602	Oil and Grease	Pesticides Herbicides
DA5-1	11/9/84	12/11	12/11	11/27 ¹	-
DA5-1 Dup	"	12/7	12/7	"	-
DA5-2	"	"	"	"	-
DA5-3	"	12/10	12/10	"	-
DA5-4	"	12/7	12/7	"	-
DA5-5	"	12/11	12/11	"	-
DA5-6	"	"	"	"	-
DA7-1	10/31/84	-	-	-	12/4
DA7-2	"	-	-	-	"
DA7-3	"	-	-	-	"
DA8-1	11/9/84	12/10	12/10	-	-
DA8-1 Dup	"	"	"	-	-
DA8-2	"	"	"	-	-
DA8-3	"	"	"	-	-
DA8-4	"	"	"	-	-
DA8-5	"	"	"	-	-
DA8-6	"	"	"	-	-

1. Extraction date

CASTLE AFB - Analysis Chronology

Soils

<u>SAMPLE ID</u>	<u>SAMPLING DATE</u>	<u>OIL & GREASE</u>	
		<u>Extraction</u>	<u>Analysis</u>
DA1-1-1	11/18/84	11/29/84	12/18/84
DA1-1-1 Dup	"	"	"
DA1-1-5	"	11/30/84	"
DA1-1-10	"	"	"
DA1-2-1	"	"	"
DA1-2-1 Dup	"	"	"
DA1-2-5	"	"	"
DA1-2-10	"	"	"
DA1-3-1	11/17/84	"	"
DA1-3-1 Dup	"	12/6/84	"
DA1-3-5	"	"	"
DA1-3-10	"	"	"
DA1-4-1	"	"	"
DA1-4-1 Dup	"	"	"
DA1-4-5	"	"	"
DA1-4-10	"	"	"
DA3-1	11/9/84	11/29/84	12/10/84
DA3-1 Dup	"	"	"
DA3-2	"	"	"
DA3-3	11/10/84	"	"
DA3-4	"	"	"
DA5-1	11/9/84	11/27/84	"
DA5-1 Dup	"	"	"
DA5-2	"	"	"
DA5-3	"	"	"
DA5-4	"	"	"
DA5-5	"	"	"
DA5-6	"	"	"

Pesticides and herbicides analytical results

Sample No.	Concentration, ug/G					
	<u>Endrin</u>	<u>Lindane</u>	<u>Methoxychlor</u>	<u>Toxaphene</u>	<u>2,4-D</u>	<u>2,4,5-TP</u>
DA3-1	ND	ND	ND	ND	ND	ND
DA3-1 Dup	ND	ND	ND	ND	ND	ND
DA3-2	ND	ND	ND	ND	ND	ND
DA3-3	ND	ND	ND	ND	ND	ND
DA3-4	ND	ND	ND	ND	ND	ND
DA7-1	ND	ND	ND	ND	ND	ND
DA7-2	ND	ND	ND	ND	ND	ND
DA7-3	ND	ND	ND	ND	ND	ND
Detection Limit	0.02	0.01	0.20	1.0	0.06	0.06

Oil and Grease results
Castle AFB

<u>Sample No.</u>	<u>Oil and Grease</u> <u>mg/kg</u>
DA1-1-1	1,800
DA1-1-1 Dup	9,500
DA1-1-5	120
DA1-1-10	120
DA1-2-1	8,500
DA1-2-1 Dup	7,500
DA1-2-5	280
DA1-2-10	150
DA1-3-1	180
DA1-3-1 Dup	200
DA1-3-5	250
DA1-3-10	950
DA1-4-1	1,500
DA1-4-1 Dup	160
DA1-4-5	750
DA1-4-10	100
DA3-1	1,700
DA3-1 Dup	1,200
DA3-2	80
DA3-3	2,400
DA3-4	160
DA5-1	100
DA5-1 Dup	80
DA5-2	120
DA5-3	110
DA5-4	90
DA5-5	120
DA5-6	80

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/KG	DAL-1-1	DAL-1-1-ID	DAL-1-5	DAL-1-1-10	DAL-2-1	DAL-2-1-ID	DAL-2-5	DAL-2-10
Chloromethane	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethene	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone	1.0	ND	ND	ND	ND	ND	ND	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/KG	DAI-3-1	DAI-3-1D	DAI-3-5	DAI-3-10	DAI-4-1	DAI-4-1D	DAI-4-5	DAI-4-10
Chloromethane	1.0	NO	NO	NO	NO	NO	NO	NO	NO
Bromomethane	1.2	NO	NO	NO	NO	NO	NO	NO	NO
Dichlorodifluoromethane	1.8	NO	NO	NO	NO	NO	NO	NO	NO
Vinyl chloride	0.2	NO	NO	NO	NO	NO	NO	NO	NO
Chloroethane	0.5	NO	NO	NO	NO	NO	NO	NO	NO
Methylene chloride	0.2	NO	NO	NO	NO	NO	NO	NO	NO
Trichlorofluoromethane		NO	NO	NO	NO	NO	NO	NO	NO
1,1-Dichloroethane	0.2	NO	NO	NO	NO	NO	NO	NO	NO
1,1-Dichloroethane	0.1	NO	NO	NO	NO	NO	NO	NO	NO
Trans-1,2-dichloroethane	0.1	NO	NO	NO	NO	NO	NO	NO	NO
Chloroform	0.1	NO	NO	NO	NO	NO	NO	NO	NO
1,2-Dichloroethane	0.02	NO	NO	NO	NO	NO	NO	NO	NO
1,1,1-Trichloroethane	0.1	NO	NO	NO	NO	NO	NO	NO	NO
Carbon tetrachloride	0.1	NO	NO	NO	NO	NO	NO	NO	NO
Bromodichloromethane	0.1	NO	NO	NO	NO	NO	NO	NO	NO
1,2-Dichloropropane	0.1	NO	NO	NO	NO	NO	NO	NO	NO
Trans-1,3-dichloropropene	0.3	NO	NO	NO	NO	NO	NO	NO	NO
Trichloroethene	0.1	NO	NO	NO	NO	NO	NO	NO	NO
Dibromochloromethane	0.1	NO	NO	NO	NO	NO	NO	NO	NO
1,1,2-Trichloroethane	0.05	NO	NO	NO	NO	NO	NO	NO	NO
Cis-1,3-dichloropropene	0.2	NO	NO	NO	NO	NO	NO	NO	NO
2-Chloroethylvinyl ether	0.2	NO	NO	NO	NO	NO	NO	NO	NO
Bromoform	0.2	NO	NO	NO	NO	NO	NO	NO	NO
1,1,2,2-Tetrachloroethane	0.05	NO	NO	NO	NO	NO	NO	NO	NO
Tetrachloroethane	0.05	NO	NO	NO	NO	NO	NO	NO	NO
Chlorobenzene	0.3	NO	NO	NO	NO	NO	NO	NO	NO
1,3-Dichlorobenzene	0.3	NO	NO	NO	NO	NO	NO	NO	NO
1,2-Dichlorobenzene	0.2	NO	NO	NO	NO	NO	NO	NO	NO
1,4-Dichlorobenzene	0.2	NO	NO	NO	NO	NO	NO	NO	NO
Benzene	0.2	NO	NO	NO	NO	NO	NO	NO	NO
Toluene	0.2	NO	NO	NO	NO	NO	NO	NO	NO
Ethylbenzene	0.2	NO	NO	NO	NO	NO	NO	NO	NO
Methyl ethyl ketone	1.0	NO	NO	NO	NO	NO	NO	NO	NO

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PTD)

Component	Detection Limit ug/KG	DA3-1	DA3-ID	DA3-2	DA3-3	DA3-4	DA4-1	DA4-ID	DA4-5
Chloromethane	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone	1.0	ND	ND	ND	ND	ND	ND	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/KG	DA4-10	DA4-11	DA4-11D	DA4-15	DA4-20	DA5-1	DA5-1D	DA5-2
Chloromethane	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone	1.0	ND	ND	ND	ND	ND	ND	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/KG	DA5-3	DA5-4	DA5-5	DA5-6	DA8-1	DA8-1D	DA8-2	DA8-3
Chloromethane	1.0	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone	1.0	ND	ND	ND	ND	ND	ND	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/KG	DA8-4	DA8-5	DA8-6
Chloromethane	1.0	ND	ND	ND
Bromomethane	1.2	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND
Chloroethane	0.5	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND
Trans-1,2-dichloroethane	0.1	ND	ND	ND
Chloroform	0.1	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND
Trans-1,3-dichloropropane	0.3	ND	ND	ND
Trichloroethene	0.1	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND
Cis-1,3-dichloropropane	0.2	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND
Bromoform	0.2	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND
Benzene	0.2	ND	ND	ND
Toluene	0.2	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND
Methyl ethyl ketone	1.0	ND	ND	ND

L.2 WATER SAMPLES: SCHEDULE OF ANALYSES
(EXCEPT TOX, REPORTED WITH ANALYTICAL DATA)

CASTLE AFB

The following dates have been previously incorrectly reported or omitted in reporting chronologies

Analysis for volatiles

<u>Sample ID</u>	<u>Sampling Dates</u>	<u>Analysis Dates</u>	
		<u>601</u>	<u>602</u>
PW3-1	11/14/84	11/15	11/15
PW3-2	11/19/84	11/21	11/21
PW3-3	"	"	"
PW3-4	"	"	"
PW3-5	11/14/84	11/15	11/15
PW3-10	1/25/85	1/31	2/4
PW3-11	2/1/85	2/6	2/12
PW3-12	2/11/85	2/25	2/21
PW3-13	2/18/85	"	"
PW31	"	"	-
PW32	"	"	-
PW33	"	"	-
PW34	"	"	-

CASTLE AFB - Analysis Chronology

<u>Lab Job No.</u>	<u>Sample ID</u>	<u>Sampling Date</u>	<u>Analysis Date</u>		
			<u>TOC</u>	<u>Phenols</u>	<u>Oil & Grease</u>
85-01-029	PW-1	1/22/85	1/28	2/6	2/11
	PW-2	"	"	"	"
	PW-3	"	"	"	"
	PW-5	"	"	"	"
	PW-6	"	"	"	"
	PW-7	"	"	"	"
	PW-8	"	"	"	"
	PW-10A	"	"	"	"
	PW-10B	"	"	"	"
	PW-11	"	"	"	"
85-01-032	TW-12	1/23/85	1/31	2/7	2/11
	TW-13	"	"	"	"
	TW-14	"	"	"	"
	TW-15	"	"	"	"
	TW-16	"	"	"	"
	TW-17	"	"	"	"
	TW-18	"	"	"	"
	TW-20	"	"	"	"
85-01-035	MW420	1/24/85	1/31	2/7	2/11
	MW450	"	"	"	"
85-01-039	MW390	1/28/85	2/1	2/11	2/5
	MW400	"	"	"	"
	MW410	"	"	"	"
	MW440	"	"	"	"
85-01-041	MW350	1/29/85	2/1	2/11	2/5
	MW360	"	"	"	"
	MW370	"	"	"	"
	MW380	"	"	"	"
	MW470	"	"	"	"
85-01-043	MW250	1/30/85	2/5	2/12	2/18
	MW260	"	"	"	"
	MW261	"	"	"	"
	MW270	"	"	"	"
	MW280	"	"	"	"
	MW430	"	"	"	"
	MW460	"	"	"	"
	MW461	"	"	"	"
	TW-19	"	"	2/13	"
	FB-1	"	"	"	"

CASTLE AFB - Analysis Chronology

<u>Lab Job No.</u>	<u>Sample ID</u>	<u>Sampling Date</u>	<u>Analysis Dates</u>		
			<u>TOC</u>	<u>Phenols</u>	<u>Oil & Grease</u>
85-02-001	MW210	1/31/85	2/6	2/13	2/19
	MW211	"	"	"	"
	MW230	"	"	"	"
	MW240	"	"	"	"
	MW320	"	"	"	"
	MW330	"	"	"	"
	MW340	"	"	"	"
	FB-2	"	"	2/14	"
	FB-3	"	"	"	"
	FB-4	"	"	"	"
85-02-006	MW220	2/1/85	2/7	2/14	2/20
	MW290	"	"	-	"
	MW300	"	"	-	"
	MW310	"	"	-	"
	MW311	"	"	-	"
85-03-004	SG-1	3/4/85	3/26	3/25	3/14
	SG-2	"	"	"	"
	SG-3	"	"	"	"
	SG-4	"	"	"	"
	SG-5	"	"	*	"
	SG-6	"	"	*	"
	SG-6A	"	"	3/25	"
	SG-7	"	"	-	"
	SG-8	"	"	-	"
	SG-9	"	"	-	"
	SG-9A	"	*	-	"
85-04-004	MW350	4/2/85	4/10	4/22	4/26
	MW360	"	"	"	"
	MW370	"	"	"	"
	MW371	"	"	"	"
	MW380	"	"	"	"
	MW400	"	"	"	"
	MW420	"	"	"	"
	MW440	"	"	"	"
	MW450	"	"	4/23	"
	MW451	"	"	"	"
85-04-006	MW230	4/3/85	4/11	4/23	4/26
	MW240	"	"	"	"
	MW241	"	"	"	"
	MW250	"	"	"	"
	MW260	"	"	"	"
	MW390	"	"	4/24	"
	MW460	"	"	"	"
	MW470	"	"	"	"
	TW-19	"	"	"	"
	FB-2	"	"	"	"

CASTLE AFB - Analysis Chronology

LAB JOB NO.	SAMPLE ID	SAMPLING DATE	ANALYSIS DATE		
			TOC	Phenols	Oil & Grease
85-04-008	FB-1	4/4/85	4/16	4/26	4/29
	MW220	"	"	"	"
	MW221	"	"	"	"
	MW270	"	"	"	"
	MW280	"	"	"	"
	MW290	"	"	4/25	"
	MW320	"	"	"	"
	MW330	"	"	"	"
	MW331	"	"	"	"
	MW340	"	"	"	"
85-04-012	MW210	4/5/85	4/17	4/25	4/29
	MW300	"	"	-	"
	MW301	"	"	-	"
	MW310	"	"	-	"
	MW410	"	"	4/25	"
85-04-015	SG-1	4/8/85	4/17	4/25	5/1
	SG-2	"	"	"	"
	SG-3	"	"	4/26	"
	SG-4	"	"	"	"
	SG-5	"	"	"	"
	SG-5A	"	4/18	"	"
	SG-6	"	"	"	"
	SG-7	"	"	-	"
	SG-7A	"	"	-	"
	SG-8	"	"	-	"
	SG-9	"	"	-	"
85-04-017	New PW	4/9/85	4/18	4/29	5/3
	PW-1	"	"	"	"
	PW-2	"	"	"	"
	PW-3	"	"	"	"
	PW-4	"	4/19	"	"
	PW-5	"	"	"	"
	PW-5A	"	"	4/30	"
	PW-6	"	"	"	"
	PW-7	"	"	"	**
	PW-8	"	"	"	5/3
	PW-8A	"	"	"	**
	PW-11	"	"	"	5/3

CASTLE AFB - Analysis Chronology

<u>LAB JOB NO.</u>	<u>SAMPLE ID</u>	<u>SAMPLING DATE</u>	<u>ANALYSIS DATES</u>		
			<u>TOC</u>	<u>Phenols</u>	<u>Oil & Grease</u>
85-04-020	TW-12	4/10/85	5/2	5/2	5/3
	TW-13	"	"	"	"
	TW-14	"	"	"	"
	TW-15	"	"	"	"
	TW-16	"	"	"	**
	TW-17	"	"	"	5/3
	TW-18	"	"	"	"
	TW-21	"	"	"	"
	MW430	"	"	"	"

Samples received broken at EAL are marked (*)

Samples that broke during analysis at EAL are marked (**)

CASTLE AFB - Additional data on extraction and analysis dates

Sample ID	Sampling Date	Extraction Date			Analysis	
		Oil and Grease	Pesticides	Herbicides	Nitrate	Metals
PW-1	1/22/85	1/23/85	-	-	-	-
PW-2	"	"	-	-	-	-
PW-3	"	"	-	-	-	-
PW-5	"	"	-	-	1/28	-
PW-6	"	"	-	-	1/28	-
PW-7	"	"	-	-	-	-
PW-8	"	"	-	-	-	-
PW-10A	"	"	-	-	-	-
PW-10B	"	"	-	-	-	-
PW-11	"	"	-	-	1/28	-
TW-12	1/23/85	1/24/85	1/24/85	1/28/85	"	1/23
TW-13	"	"	"	"	"	"
TW-14	"	"	-	-	-	-
TW-15	"	"	1/24	1/28	1/28	1/23
TW-16	"	"	-	-	-	-
TW-17	"	"	1/24	1/28	1/28	1/23
TW-18	"	"	-	-	-	-
TW-20	"	"	1/24	1/28	1/28	1/23
MW420	1/24/85	1/25/85	1/28	1/29	1/28	1/28
MW450	"	"	-	-	-	-
MW350	1/29/85	1/30/85	2/1	1/31	2/4	2/5
MW360	"	"	"	"	"	"
MW370	"	"	"	"	"	"
MW380	"	"	"	"	"	"
MW470	"	"	"	"	"	"
MW250	1/30/85	1/31/85	"	"	"	"
MW260	"	"	"	2/4	"	"
MW261	"	"	"	1/31	"	"
MW270	"	"	"	2/4	"	"
MW280	"	"	"	"	"	"

CASTLE AFB - Additional data on extraction and analysis dates

Sample ID	Sampling Date	Extraction Date			Analysis	
		Oil and Grease	Pesticides	Herbicides	Nitrate	Metals
MW430	1/30/85	1/31/85	-	-	-	-
MW460	"	"	2/1	2/4	2/4	2/5
MW461	"	"	"	"	"	"
TW-19	"	"	-	-	"	-
FB-1	"	"	2/1	2/4	"	2/5
MW210	1/31/85	2/1/85	-	-	-	-
MW211	"	"	-	-	-	-
MW230	"	"	2/1	2/5	2/4	2/5
MW240	"	"	"	"	"	"
MW320	"	"	-	-	"	-
MW330	"	"	-	-	"	-
MW340	"	"	-	-	"	-
FB-2	"	"	2/1	2/5	"	2/5
FB-3	"	"	-	-	-	-
FB-4	"	"	-	-	-	-
MW220	2/1/85	2/5/85	-	-	-	-
MW290	"	"	-	-	-	-
MW300	"	"	-	-	-	-
MW310	"	"	-	-	-	-
MW311	"	"	-	-	-	-
New PW	3/4/85	3/6/85	-	-	-	-
SG-1	"	"	3/11	3/8	3/20	3/14
SG-2	"	"	"	"	"	"
SG-3	"	"	"	"	"	"
SG-4	"	"	"	"	"	"
SG-5	"	"	"	"	"	"
SG-6	"	"	"	"	"	"
SG-6A	"	"	"	"	"	"
SG-7	"	"	-	-	-	-
SG-8	"	"	-	-	-	-
SG-9	"	"	-	-	-	-
SG-9A	"	"	-	-	-	-

CASTLE AFB - Additional data on extraction and analysis dates

Sample ID	Sampling Date	Extraction Date			Analysis
		Oil and Grease	Pesticides	Herbicides	
MW350	4/2/85	4/24/85	4/8	4/9	4/12
MW360	"	"	"	"	"
MW370	"	"	"	"	"
MW371	"	"	"	"	"
MW380	"	"	"	"	"
MW400	"	"	"	"	"
MW420	"	"	4/9	"	"
MW440	"	"	-	-	-
MW450	"	"	-	-	-
MW451	"	"	-	-	-
MW230	4/3/85	"	4/9	4/10	4/12
MW240	"	"	"	"	"
MW241	"	"	"	"	"
MW250	"	"	"	"	"
MW260	"	"	4/10	"	"
MW390	"	"	"	"	"
MW460	"	"	"	"	"
MW470	"	"	"	"	"
TW-19	"	"	-	-	-
FB-2	"	"	4/9	4/10	4/12
FB-1	4/4/85	4/25/85	4/10	4/16	"
MW220	"	"	-	-	-
MW221	"	"	-	-	-
MW270	"	"	4/10	4/16	4/12
MW280	"	"	4/11	"	"
MW290	"	"	-	-	-
MW320	"	"	-	-	-
MW330	"	"	-	-	-
MW331	"	"	-	-	-
MW340	"	"	-	-	-

CASTLE AFB - Additional data on extraction and analysis dates

Sample ID	Sampling Date	Extraction Date		Analysis	
		Oil and Grease	Pesticides	Herbicides	Nitrate Metals
MW210 v	4/5/85	4/25/85	-	-	-
MW300	"	"	-	-	-
MW301	"	"	-	-	-
MW310	"	"	-	-	-
MW410	"	"	4/11	4/11	4/12
SG-1	4/8/85	"	"	4/15	"
SG-2	"	4/26	"	"	"
SG-3	"	4/25	"	"	"
SG-4	"	"	"	"	"
SG-5	"	"	"	"	"
SG-5A	"	4/26	4/15	"	"
SG-6	"	4/25	"	"	"
SG-7	"	4/26	-	-	-
SG-7A	"	4/25	-	-	-
SG-8	"	4/26	-	-	-
SG-9	"	"	-	-	-
New PW	4/9/85	"	-	-	-
PW-1	"	"	-	-	-
PW-2	"	4/30	-	-	-
PW-3	"	"	-	-	-
PW-4	"	"	4/15	4/16	4/12
PW-5	"	"	-	-	-
PW-5A	"	"	-	-	-
PW-6	"	"	-	-	-
PW-7	"	"	-	-	-
PW-8	"	"	-	-	-
PW-8A	"	"	-	-	-
PW-11	"	"	-	-	4/24

CASTLE AFB - Additional data on extraction and analysis dates

Sample ID	Sampling Date	Extraction Date			Analysis	
		Oil and Grease	Pesticides	Herbicides	Nitrate	Metals
TW-12	4/10/85	4/30/85	4/15	4/11	4/24	4/12
TW-13	"	"	"	4/16	"	"
TW-14	"	"	"	"	"	"
TW-15	"	"	4/15	4/16	4/24	4/12
TW-16	"	"	"	"	"	"
TW-17	"	"	4/15	4/16	4/24	4/12
TW-18	"	"	"	"	"	"
TW-21	"	"	"	"	"	"
MW430	"	"	"	"	"	"

Lab No. 85-01-021

Sampling and analysis data

<u>Sample No.</u>	<u>Weston Lab No.</u>	<u>Parameters</u>	<u>Date sampled</u>	<u>Date analyzed</u>	
				<u>601</u>	<u>602</u>
PW3-6	85-01-021-01,02,03	Volatiles & MEK	1/14/85	1/21	1/29
PW3-7	85-01-021-04,05,06	Volatiles & MEK	1/17/85	1/21	1/29
PW3-8	85-01-021-07,08,09	Volatiles & MEK	1/17/85	1/21	1/29
PW3-9	85-01-021-10,11,12	Volatiles & MEK	1/18/85	1/21	1/29

Sampling and analysis calendar

Sample No.	Date Sampled	Date Analyzed						
		EPA 601	EPA 602	TOC	TOX	Oil & Grease	Phenolics	Nitrate
PW-1	1/22/85	1/28	2/4	1/23 ¹	1/24 ²	1/23 ³	1/24 ¹	-
PW-2	"	"	"	"	"	"	"	-
PW-3	"	"	"	"	"	"	"	-
PW-5	"	"	"	"	"	"	"	1/28
PW-6	"	"	"	"	"	"	"	"
PW-7	"	1/24	"	"	"	"	"	-
PW-8	"	"	"	"	"	"	"	-
PW-10A	"	"	"	"	"	"	"	-
PW-10B	"	"	"	"	"	"	"	-
PW-11	"	"	"	"	"	"	"	1/28

1) Samples or extracts sent to EAL for the indicated analyses on the indicated date

2) Samples sent to Weston Lab, Lionville, on the indicated date

3) Samples were extracted on the indicated date

Sampling and analysis calendar

Sample No.	Date Sampled	Date Analyzed									
		601	602	TOC	TOX	Oil and Grease	Phenols	Nitrate	Metals	Pests	Herbs
TW-12	1/23/85	1/28	2/4	1/24 ¹	1/24 ²	1/24 ³	1/24	1/28	1/23	1/29	1/30
TW-13	"	"	"	"	"	"	"	"	"	"	"
TW-14	"	"	"	"	"	"	"	"	"	"	"
TW-15	"	1/30	"	"	"	"	"	1/28	1/23	1/29	1/30
TW-16	"	"	"	"	"	"	"	"	"	"	"
TW-17	"	"	"	"	"	"	"	1/28	1/23	1/29	1/30
TW-18	"	"	"	"	"	"	"	"	"	"	"
TW-20	"	"	"	"	"	"	"	1/28	1/23	1/29	1/30

1) Samples sent to EAL on the indicated date

2) Samples sent to Weston Lab, Lionvillee, on the indicated date

3) Samples were extracted on the indicated date.

Sampling and analysis calendar

Sample No.	Date Sampled	Date Analyzed									
		601	602	TOC	TOX	Oil and Grease	Phenols	Nitrate	Metals	Pests	Herbs
MW 350	1/29/85	2/7	2/1	1/30 ¹	1/30 ²	1/30 ³	1/30 ¹	2/4	2/5	2/12	2/6
MW 360	"	2/1	"	"	"	"	"	"	"	"	"
MW 370	"	2/7	"	"	"	"	"	"	"	"	"
MW 380	"	1/31	"	"	"	"	"	"	"	"	"
MW 470	"	2/1	"	"	"	"	"	"	"	"	"

- 1) Samples sent to EAL on the date indicated
- 2) Samples sent to Weston, Lionville, on the date indicated
- 3) Samples extracted on the date indicated.

Sampling and analysis calendar

Sample No.	Date Sampled	Date Analyzed									
		601	602	TOC	TOX	Oil and Grease	Phenols	Nitrate	Metals	Pests	Herbs
MW 250	1/30/85	2/6	2/12	1/31 ¹	1/31 ²	1/31 ³	1/31 ¹	2/4	2/5	2/12	2/6
MW 260	"	"	"	"	"	"	"	"	"	"	"
MW 261	"	2/5	"	"	"	"	"	"	"	"	"
MW 270	"	"	"	"	"	"	"	"	"	"	"
MW 280	"	"	"	"	"	"	"	"	"	"	"
MW 430	"	2/6	"	"	"	"	"	-	-	-	-
MW 460	"	2/5	"	"	"	"	"	2/4	2/5	2/12	2/6
MW 461	"	"	"	"	"	"	"	"	"	"	"
TW-19	"	2/7	"	"	"	"	"	"	-	-	-
FB-1	"	2/5	"	"	"	"	"	"	2/5	2/12	2/6

- 1) Samples sent to EAL on date indicated
- 2) Samples sent to Weston, Lionville, on date indicated
- 3) Samples extracted on date indicated

Sampling and analysis calendar

Sample No.	Date Sampled	Date Analyzed									
		601	602	TOC	TOX	Oil and Grease	Phenols	Nitrate	Metals	Pests	Herbs
MW 210	1/31/85	2/6	2/12	2/1 ¹	2/1 ²	2/1 ³	2/1 ¹	-	-	-	-
MW211	"	"	"	"	"	"	"	-	-	-	-
MW230	"	"	"	"	"	"	"	2/4	2/5	2/12	2/6
MW240	"	"	"	"	"	"	"	"	"	"	"
MW320	"	2/4	"	"	"	"	"	"	-	-	-
MW330	"	"	"	"	"	"	"	"	-	-	-
MW340	"	"	"	"	"	"	"	"	-	-	-
FB-2	"	"	"	"	"	"	"	"	2/5	2/12	2/6
FB-3	"	"	"	"	"	"	"	-	-	-	-
FB-4	"	"	"	"	"	"	"	-	-	-	-

- 1) Samples sent to EAL on indicated date
- 2) Samples sent to Weston, Lionville, on indicated date
- 3) Samples extracted on indicated date

Sampling and analysis calendar

Sample No.	Date Sampled	Date Analyzed									
		601	602	TOC	TOX	Oil and Grease	Phenols	Nitrate	Metals	Pests	Herbs
PW3-10	1/25/85	1/31	2/4	- ¹	- ²	- ³	- ¹	-	-	-	-
MW420	1/24/85	1/31	2/4	1/28	1/28	1/25	1/28	1/28	1/28	1/29	1/30
MW450	"	"	"	"	"	"	"	"	"	-	-

1) Samples sent to EAL on the dates indicated

2) Samples sent to Weston, Lionville, on the date indicated

3) Samples were extracted on the date indicated.

Sampling and analysis calendar

Sample No.	Date Sampled	Date Analyzed									
		601	602	TOC	TOX	Oil and Grease	Phenols	Nitrate	Metals	Pests	Herbs
MW 390	1/28/85	1/31	2/11	1/28 ¹	1/28 ²	1/29 ³	1/28 ¹	2/6	2/6	1/30	1/30
MW 400	"	"	"	"	"	"	"	"	"	"	"
MW 410	"	"	"	"	"	"	"	"	"	"	"
MW 440	"	"	"	"	"	"	"	-	-	-	-

1) Samples sent to EAL on date indicated

2) Samples sent to Weston, Lionville, on date indicated

3) Samples extracted on date indicated.

Sampling and analysis calendar

Sample No.	Date Sampled	Date Analyzed					
		601	602	TOC	TOX	Oil and Grease	Phenols
MV220	2/1/85	2/7	2/12	2/5 ¹	2/5 ²	2/5 ³	2/5 ¹
MW290	"	"	"	"	"	"	"
MW300	"	"	"	"	"	"	"
MW310	"	"	"	"	"	"	"
MW311	"	"	"	"	"	"	"
PW3-11	"	2/6	"	-	-	-	"

- 1) Samples shipped to EAL on the date indicated
- 2) Samples shipped to Weston, Lionville, on the date indicated
- 3) Samples extracted on the date indicated

Sampling and analysis calendar

Sample No.	Date Sampled	Date Analyzed									
		601	602	TOC	TOX	Oil and Grease	Phenols	Nitrate	Metals	Pests	Herbs
New PW	3/4/85	3/13	3/15	3/6 ¹	3/13	3/6 ²	3/6 ¹	-	-	-	-
SG-1	"	"	"	"	"	"	"	3/20	3/14	3/12	3/13
SG-2	"	"	"	"	"	"	"	"	"	"	"
SG-3	"	"	"	"	"	"	"	"	"	"	"
SG-4	"	"	"	"	"	"	"	"	"	"	"
SG-5	"	"	"	"	"	"	"	"	"	"	"
SG-6	"	"	"	"	"	"	"	"	"	"	"
SG-6A	"	"	"	"	"	"	"	"	"	"	"
SG-7	"	"	"	"	"	"	-	-	-	-	-
SG-8	"	"	"	"	"	"	-	-	-	-	-
SG-9	"	"	"	"	"	"	-	-	-	-	-
SG-9A	"	"	"	"	"	"	-	-	-	-	-

SAMPLING AND ANALYSIS CHRONOLOGY - Castle AFB, April 1985

Sample No.	Sampling Date	601 & 602 Analysis Date	Pesticides		Herbicides		Oil and Grease	
			Extraction	Analysis	Extraction	Analysis	Extraction	Analysis
MW350	4/2/85	-	4/8/85	4/9/85	4/9/85	4/15/85	4/24/85	
MW360	"	-	"	"	"	"	"	
MW370	"	-	"	"	"	"	"	
MW371	"	-	"	"	"	"	"	
MW380	"	-	"	"	"	"	"	
MW400	"	4/16/85	"	"	"	"	"	
MW420	"	"	4/9/85	4/16/85	"	"	"	
MW440	"	"	-	-	-	-	-	
MW450	"	"	-	-	-	-	-	
MW451	"	"	-	-	-	-	-	

SAMPLING AND ANALYSIS CHRONOLOGY - Castle AFB, April 1985

Sample No.	Sampling Date	601 & 602 Analysis Date	Pesticides		Herbicides		Oil and Grease	
			Extraction	Analysis	Extraction	Analysis	Extraction	Analysis
MW230	4/3/85	4/16/85	4/9/85	4/16/85	4/10/85	4/15/85	4/24/85	
MW240	"	"	"	"	"	"	"	
MW241	"	"	"	"	"	"	"	
MW250	"	"	"	"	"	"	"	
MW260	"	"	4/10/85	"	"	"	"	
MW390	"	-	"	"	"	"	"	
MW460	"	-	"	"	"	"	"	
MW470	"	-	"	"	"	"	"	
TW-19	"	-	-	-	-	-	-	
FB-2	"	4/16/85	4/9/85	4/16/85	4/10/85	4/15/85	"	

SAMPLING AND ANALYSIS CHRONOLOGY - Castle AFB, April 1985

Sample No.	Sampling Date	601 & 602 Analysis Date	Pesticides		Herbicides		Oil and Grease Extraction
			Extraction Analysis	Extraction Analysis	Extraction Analysis	Extraction Analysis	
FB-1	4/4/85	4/16/85	4/10/85	4/16/85	4/10/85	4/15/85	4/25/85
MW220	"	"	-	-	-	-	"
MW221	"	"	-	-	-	-	"
MW270	"	"	4/10/85	4/16/85	4/10/85	4/15/85	"
MW280	"	"	4/11/85	"	"	"	"
MW290	"	-	-	-	-	-	"
MW320	"	-	-	-	-	-	"
MW330	"	-	-	-	-	-	"
MW331	"	-	-	-	-	-	"
MW340	"	-	-	-	-	-	"

LAB NO. 85-04-012

SAMPLING AND ANALYSIS CHRONOLOGY - Castle AFB, April 1985

Sample No.	Sampling Date	601 & 602 Analysis Date	Pesticides Extraction Analysis	Herbicides Extraction Analysis	Oil and Grease Extraction
MW210	4/5/85	4/9/85	-	-	4/25/85
MW300	"	-	-	-	"
MW301	"	-	-	-	"
MW410	"	4/9/85	4/11/85	4/11/85	"
W-1	"	"	-	-	-
W-2	"	"	-	-	-
W-3	"	"	-	-	-
MW310	"	-	-	-	4/25/85

SAMPLING AND ANALYSIS CHRONOLOGY - Castle AFB, April 1985

Sample No.	Sampling Date	601 & 602 Analysis Date	Pesticides		Herbicides		Oil and Grease Extraction
			Extraction	Analysis	Extraction	Analysis	
SG-1	4/8/85	4/17/85	4/11/85	4/24/85	4/15/85	4/18/85	4/25/85
SG-2	"	"	"	"	"	"	4/26/85
SG-3	"	4/24/85	"	"	"	"	4/25/85
SG-4	"	4/17/85	"	"	"	"	"
SG-5	"	"	"	"	"	"	"
SG-5A	"	4/24/85	4/15/85	"	"	"	4/26/85
SG-6	"	4/17/85	"	"	"	"	4/25/85
SG-7	"	"	-	-	-	-	4/26/85
SG-7A	"	"	-	-	-	-	4/25/85
SG-8	"	"	-	-	-	-	4/26/85
SG-9	"	"	-	-	-	-	"

SAMPLING AND ANALYSIS CHRONOLOGY - Castle AFB, April 1985

Sample No.	Sampling Date	601 & 602 Analysis Date	Pesticides Extraction Analysis	Herbicides Extraction Analysis	Oil and Grease Extraction
New PW	4/9/85	4/17/85	-	-	4/26/85
PW-1	"	4/18/85	-	-	"
PW-2	"	"	-	-	4/30/85
PW-3	"	"	-	-	"
PW-4	"	"	4/15/85	4/16/85	"
PW-5	"	"	4/24/85	4/18/85	"
PW-5A	"	"	-	-	"
PW-6	"	"	-	-	"
PW-7	"	"	-	-	"
PW-8	"	"	-	-	"
PW-8A	"	4/19/85	-	-	"
PW-11	"	"	-	-	"

SAMPLING AND ANALYSIS CHRONOLOGY - Castle AFB, April 1985

Sample No.	Sampling Date	601 & 602 Analysis Date	Pesticides		Herbicides		Oil and Grease Extraction
			Extraction Analysis	Extraction Analysis	Extraction Analysis	Extraction Analysis	
TW-12	4/10/85	4/19/85	4/15/85	4/24/85	4/11/85	4/18/85	4/30/85
TW-13	"	"	"	"	4/16/85	"	"
TW-14	"	"	-	-	-	-	"
TW-15	"	"	4/15/85	4/24/85	4/16/85	4/18/85	"
TW-16	"	"	-	-	-	-	"
TW-17	"	"	4/15/85	4/24/85	4/16/85	4/18/85	"
TW-18	"	"	-	-	-	-	"
TW-21	"	"	-	-	-	-	"
MW370	"	4/22/85	-	-	-	-	-
MW380	"	"	-	-	-	-	-
MW360	"	"	-	-	-	-	-
MW390	"	"	-	-	-	-	-
MW430	"	"	-	-	-	-	-

SAMPLING AND ANALYSIS CHRONOLOGY - Castle AFB, April 1985

Sample No.	Sampling Date	601 & 602 Analysis Date	Pesticides Extraction Analysis	Herbicides Extraction Analysis	Oil and Grease Extraction
MW290	4/11/85	4/22/85	-	-	-
MW300	"	"	-	-	-
MW301	"	4/23/85	-	-	-
MW310	"	4/24/85	-	-	-
MW320	"	4/23/85	-	-	-
MW330	"	4/24/85	-	-	-
MW331	"	"	-	-	-
MW340	"	4/23/85	-	-	-
MW350	"	"	-	-	-
MW460	"	"	-	-	-
MW470	"	"	-	-	-
TW-19	"	4/22/85	-	-	-
FB-2	"	"	-	-	-

L.3 PW-3 PILOT TEST AND
ROUND 1 WATER SAMPLES: DATA REPORTS

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L					
		PW3-1	PW3-2	PW3-3	PW3-4	PW3-5	TW14-1
Chloromethane	1.0	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	0.95	4.9	2.9	1.6	6.6	1.2
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	1.0	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethene	0.1	1.1	1.4	1.6	1.3	1.3	7.2
Chloroform	0.1	0.64	0.24	0.25	0.16	0.23	3.1
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	0.35	1.3	2.4	0.31	0.61	0.16
Carbon tetrachloride	0.1	0.62	ND	ND	0.22	0.49	0.27
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	44	17	43	18	43	260
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	0.14	0.40	0.44	ND	0.48	0.29
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND	ND	ND
Toluene	0.2	ND	ND	660	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone	1.0	ND	ND	ND	ND	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/FID)

Component	Detection Limit ug/L	Concentration, ug/L				
		Blank	PW3-6	PW3-7	PW3-8	PW3-9
Chloromethane	0.1	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND
Vinyl Chloride	0.2	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND
Methylene Chloride	0.2	ND	5.7	3.2	4.6	4.8
Trichlorofluoromethane		ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND
Trans-1,2-dichloroethene	0.1	ND	0.78	0.81	0.96	1.3
Chloroform	0.1	ND	0.26	0.10	0.17	0.17
1,2-Dichloroethane	0.02	ND	0.05	0.04	0.03	ND
1,1,1-Trichloroethane	0.1	ND	0.95	0.33	ND	ND
Carbon tetrachloride	0.1	ND	0.76	0.56	0.77	0.93
Bromodichloromethane	0.1	ND	ND	ND	ND	0.18
1,2-Dichloropropane	0.1	ND	0.12	ND	0.10	ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	6.7	14	11	13
Dibromochloromethane	0.1	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	0.08	0.08	0.10	0.10
Chlorobenzene	0.3	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	0.38	0.49	0.38	0.42
Benzene	0.2	ND	ND	ND	ND	ND
Toluene	0.2	ND	ND	0.69	0.91	1.6
Ethylbenzene	0.2	ND	ND	0.47	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L PW-3-12
Chloromethane	1.0	ND
Bromomethane	1.2	ND
Dichlorodifluoromethane	1.8	ND
Vinyl chloride	0.2	ND
Chloroethane	0.5	ND
Methylene chloride	0.2	ND
Trichlorofluoromethane		ND
1,1-Dichloroethene	0.2	ND
1,1-Dichloroethane	0.1	ND
Trans-1,2-dichloroethene	0.1	ND
Chloroform	0.1	ND
1,2-Dichloroethane	0.02	ND
1,1,1-Trichloroethane	0.1	ND
Carbon tetrachloride	0.1	ND
Bromodichloromethane	0.1	ND
1,2-Dichloropropane	0.1	ND
Trans-1,3-dichloropropene	0.3	ND
Trichloroethene	0.1	3.2
Dibromochloromethane	0.1	ND
1,1,2-Trichloroethane	0.05	ND
Cis-1,3-dichloropropene	0.2	ND
2-Chloroethylvinyl ether	0.2	ND
Bromoform	0.2	ND
1,1,2,2-Tetrachloroethane	0.05	ND
Tetrachloroethene	0.05	ND
Chlorobenzene	0.3	ND
1,3-Dichlorobenzene	0.3	ND
1,2-Dichlorobenzene	0.2	ND
1,4-Dichlorobenzene	0.2	ND
Benzene	0.2	ND
Toluene	0.2	ND
Ethylbenzene	0.2	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L			
		PW3-13	PW-31	PW-32	PW-33 PW-34
Chloromethane	1.0	ND	-	-	-
Bromomethane	1.2	ND	-	-	-
Dichlorodifluoromethane	1.8	ND	-	-	-
Vinyl chloride	0.2	ND	-	-	-
Chloroethane	0.5	ND	-	-	-
Methylene chloride	0.2	ND	-	-	-
Trichlorofluoromethane		ND	-	-	-
1,1-Dichloroethene	0.2	ND	-	-	-
1,1-Dichloroethane	0.1	ND	-	-	-
Trans-1,2-dichloroethene	0.1	ND	-	-	-
Chloroform	0.1	ND	-	-	-
1,2-Dichloroethane	0.02	ND	-	-	-
1,1,1-Trichloroethane	0.1	ND	-	-	-
Carbon tetrachloride	0.1	ND	-	-	-
Bromodichloromethane	0.1	ND	-	-	-
1,2-Dichloropropane	0.1	ND	-	-	-
Trans-1,3-dichloropropene	0.3	ND	-	-	-
Trichloroethene	0.1	7.4	9.0	9.8	11
Dibromochloromethane	0.1	ND	-	-	-
1,1,2-Trichloroethane	0.05	ND	-	-	-
Cis-1,3-dichloropropene	0.2	ND	-	-	-
2-Chloroethylvinyl ether	0.2	ND	-	-	-
Bromoform	0.2	ND	-	-	-
1,1,2,2-Tetrachloroethane	0.05	ND	-	-	-
Tetrachloroethene	0.05	ND	-	-	-
Chlorobenzene	0.3	ND	-	-	-
1,3-Dichlorobenzene	0.3	ND	-	-	-
1,2-Dichlorobenzene	0.2	ND	-	-	-
1,4-Dichlorobenzene	0.2	ND	-	-	-
Benzene	0.2	ND	-	-	-
Toluene	0.2	ND	-	-	-
Ethylbenzene	0.2	ND	-	-	-
Methyl Ethyl Ketone	1.0	ND	-	-	-

inter-office memorandum

TO: Fred Bopp

DATE: March 6, 1985

cc: Alison Dunn, Concord Office

FROM: David Ben-Hur, Stockton Laboratory

DB

SUBJECT: Analysis for volatiles, Castle AFB
Weston Lab No. 85-01-021

W. O. No.: 0628-09-02

Attached are results for the analysis of volatiles by Methods 601 and 602 on samples received in Mid-January. The analytical request has also included the analysis for MEK. While the MEK analysis has been performed, these results are not yet available since certain measurements concerning the recoverability of the compound still need to be done. These results will be submitted separately.

Second column verification has been performed. However, the noise level on the second column runs is such that it precludes confirmation of the low levels of components found in these samples.

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L										
		Blank	FW-1	FW-2	FW-3	FW-5	FW-6	FW-7	FW-8	FW-10A	FW-10B	FW-11
Chloromethane	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND	1.0	0.90	1.0	0.70	0.40
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	0.86	0.75	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	0.76	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	ND	ND	25	7.3	1.3	ND	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	0.24	ND	0.12	0.13	ND
Tetrachloroethene	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	0.32	0.32	0.30	ND	0.30	0.31	0.33	ND	0.31
Benzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	3.0	ND	1.5	ND	6.7	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L					
		TW-12	TW-13	TW-14	TW-15	TW-16	TW-17
Chloromethane	1.0	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethene	0.1	ND	ND	ND	ND	ND	1.6
Chloroform	0.1	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	67	220	21	ND	40
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	0.33	ND	0.25	ND	ND	0.37
Chlorobenzene	0.3	ND	ND	ND	0.75	ND	ND
1,3-Dichlorobenzene	0.3	1.8	ND	ND	ND	1.6	ND
1,2-Dichlorobenzene	0.2	1.0	ND	0.89	ND	1.3	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	0.84	ND
Benzene	0.2	ND	ND	0.82	ND	0.75	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	1.1	2.8	ND	ND	2.7

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L						
		MW210	MW211	MW230	MW240	MW320	MW330	MW340
Chloromethane	1.0	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	0.2	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	4.9	5.1	ND	ND	5.5	7.2	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	67	86	ND	ND	ND	0.44	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethane	0.05	6.8	8.5	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	0.45	0.32	ND	ND	ND	ND
Toluene	0.2	ND	0.21	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L									
		MW 250	MW 260	MW 261	MW 270	MW 280	MW 430	MW 460	MW 461	TW-19	PB-1
Chloromethane	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	17
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND	10	8.0	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	0.15	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	0.06	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2	0.34	0.38	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2	ND	0.29	ND	ND	ND	ND	0.46	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L				
		MW220	MW290	MW300	MW310	MW311 PW3-11
Chloromethane	1.0	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	0.32	ND	ND	ND	ND
Trans-1,2-dichloroethene	0.1	0.74	ND	1.9	1.1	0.59
Chloroform	0.1	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	1.4	2.7	4.0
Carbon tetrachloride	0.1	0.51	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND
Trichloroethene	0.1	36	ND	4.2	22	13
Dibromochloromethane	0.1	ND	ND	ND	ND	19
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	0.05	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND
Benzene	0.2	ND	0.42	0.25	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L			
		MW 350	MW 360	MW 370	MW 380 MW 470
Chloromethane	1.0	ND	ND	ND	ND ND
Bromomethane	1.2	ND	ND	ND	ND ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND ND
Vinyl chloride	0.2	ND	ND	ND	ND ND
Chloroethane	0.5	ND	ND	ND	ND ND
Methylene chloride	0.2	ND	ND	ND	ND ND
Trichlorofluoromethane		ND	ND	ND	ND ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND ND
Trans-1,2-dichloroethene	0.1	ND	ND	ND	ND ND
Chloroform	0.1	ND	ND	ND	ND ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND ND
Carbon tetrachloride	0.1	ND	ND	ND	ND ND
Bromodichloromethane	0.1	ND	ND	ND	ND ND
1,2-Dichloropropane	0.1	ND	0.21	ND	ND ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND ND
Trichloroethene	0.1	ND	ND	ND	ND ND
Dibromochloromethane	0.1	ND	ND	ND	ND ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND ND
Bromoform	0.2	ND	ND	ND	ND ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND ND
Tetrachloroethene	0.05	ND	ND	ND	ND ND
Chlorobenzene	0.3	ND	ND	ND	ND ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND ND
Benzene	0.2	ND	ND	ND	ND ND
Toluene	0.2	ND	ND	ND	ND ND
Ethylbenzene	0.2	ND	ND	ND	ND ND

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L			
		MW 390	MW 400	MW 410	MW 440
Chloromethane	1.0	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	0.93	ND
Chloroethane	0.5	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND
Trans-1,2-dichloroethene	0.1	ND	ND	0.22	2.3
Chloroform	0.1	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	0.49	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND
Trichloroethene	0.1	ND	ND	0.14	2.0
Dibromochloromethane	0.1	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND
Chlorobenzene	0.3	ND	0.92	ND	ND
1,3-Dichlorobenzene	0.3	ND	0.54	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	0.58	ND
Benzene	0.2	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	2.3

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L	
		PW3-10	MW420 MW450
Chloromethane	1.0	ND	ND
Bromomethane	1.2	ND	ND
Dichlorodifluoromethane	1.8	ND	ND
Vinyl chloride	0.2	ND	ND
Chloroethane	0.5	ND	ND
Methylene chloride	0.2	ND	ND
Trichlorofluoromethane		ND	ND
1,1-Dichloroethene	0.2	ND	ND
1,1-Dichloroethane	0.1	ND	ND
Trans-1,2-dichloroethene	0.1	0.85	1.9
Chloroform	0.1	ND	ND
1,2-Dichloroethane	0.02	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND
Carbon tetrachloride	0.1	ND	ND
Bromodichloromethane	0.1	ND	ND
1,2-Dichloropropane	0.1	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND
Trichloroethene	0.1	45	3.7
Dibromochloromethane	0.1	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND
Bromoform	0.2	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND
Tetrachloroethene	0.05	ND	0.06
Chlorobenzene	0.3	ND	ND
1,3-Dichlorobenzene	0.3	0.82	ND
1,2-Dichlorobenzene	0.2	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND
Benzene	0.2	ND	ND
Toluene	0.2	ND	ND
Ethylbenzene	0.2	4.9	2.9

inter-office memorandum

TO: Fred Bopp

DATE: March 26, 1985

cc: Alison Dunn, Concord Office

FROM: David Ben-Hur, Stockton Laboratory

SUBJECT: MEK Results, Castle AFB

W. O. No.: 0628-09-02

Attached are the MEK results for all the samples that have been previously reported for the January sampling period. Only one of the samples, MW260, showed a measurable level of MEK. It is my suspicion, due to the general absence of MEK in the other samples, that the one positive result is somehow the result of a contamination not related to the sample itself.

RESULTS OF ANALYSIS FOR MEK

Castle Air Force Base

<u>Lab Job No.</u>	<u>Sample No.</u>	<u>MEK, ug/L</u>
85-01-021	PW3-6	ND
	PW3-7	ND
	PW3-8	ND
	PW3-9	ND
85-01-029	PW-1	ND
	PW-2	ND
	PW-3	ND
	PW-5	ND
	PW-6	ND
	PW-7	ND
	PW-8	ND
	PW-10A	ND
	PW-10B	ND
	PW-11	ND
85-01-032	TW-12	ND
	TW-13	ND
	TW-14	ND
	TW-15	ND
	TW-16	ND
	TW-17	ND
	TW-18	ND
	TW-20	ND
85-01-039	MW390	ND
	MW400	ND
	MW410	ND
	MW440	ND
85-01-041	MW350	ND
	MW360	ND
	MW370	ND
	MW380	ND
	MW470	ND
85-01-043	MW250	ND
	MW260	2.0
	MW261	ND
	MW270	ND
	MW280	ND
	MW430	ND
	MW460	ND
	MW461	ND
	TW-19	ND
	FB-1	ND

AD-A168 238

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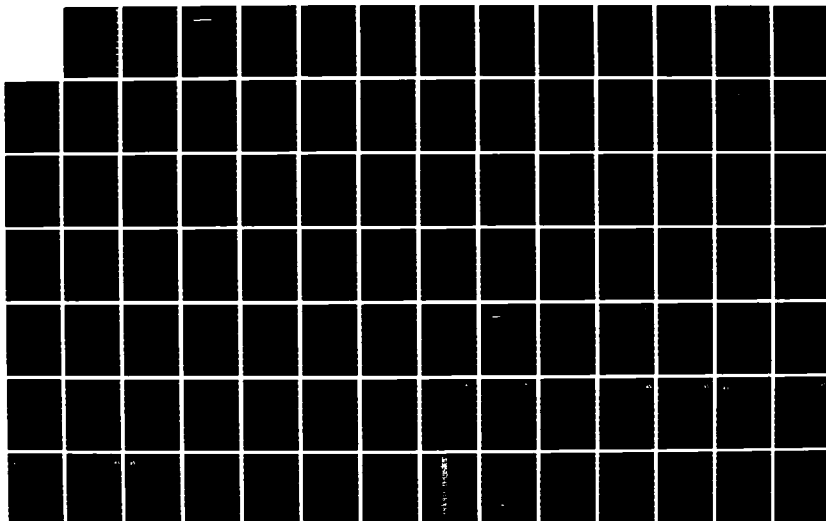
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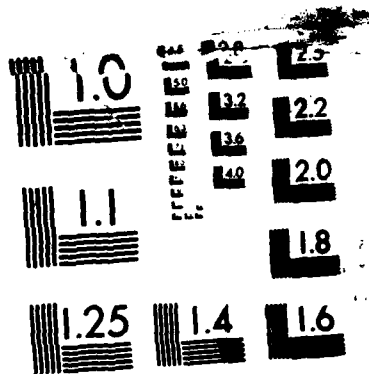
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MICROCOPY RESOLUTION TEST CHART
 NATIONAL BUREAU OF STANDARDS-1963-A

<u>Lab Job No.</u>	<u>Sample No.</u>	<u>MEK, ug/L</u>
85-02-001	MW210	ND
	MW211	ND
	MW230	ND
	MW240	ND
	MW320	ND
	MW330	ND
	MW340	ND
	FB-2	ND
	FB-3	ND
	FB-4	ND
85-02-006	MW220	ND
	MW290	ND
	MW300	ND
	MW310	ND
	MW311	ND
	PW3-11	ND
85-02-019	PW3-12	ND
Detection Limit		1.0

inter-office memorandum

TO: Katherine Sheedy

DATE: April 11, 1985

FROM:  Stockton Laboratory *JB*

SUBJECT: MEK results from samples from Castle AFB

W. O. No.: 0628-09-02

The following results were inadvertently omitted from previous reports:

<u>Sample No.</u>	<u>MEK, ug/L</u>
PW3-10	ND
MW-420	ND
MW-450	ND
Detection Limit	1

LAB NO. 85-01-029

Results of analysis for phenols, TOC and nitrate for Castle AFB

<u>Sample</u>	<u>Phenols</u> <u>mg/L</u>	<u>TOC</u> <u>mg/L</u>	<u>Nitrate</u> <u>mg/L</u>
PW-1	ND	ND	-
PW-2	ND	ND	-
PW-3	ND	ND	-
PW-5	ND	ND	17
PW-6	ND	ND	17
PW-7	ND	ND	-
PW-8	ND	ND	-
PW-10A	ND	ND	-
PW-10B	ND	ND	-
PW-11	ND	ND	17
Detection Limit	0.1	1.0	0.1

LAB NO. 85-01-32

Analysis for metals and nitrate. Castle AFB

Sample	Concentration, mg/L					
	<u>Cadmium</u>	<u>Chromium</u>	<u>Lead</u>	<u>Mercury</u>	<u>Silver</u>	<u>Nitrate</u>
TW-12	ND	ND	ND	ND	ND	64
TW-13	ND	ND	ND	ND	ND	61
TW-15	ND	ND	ND	ND	ND	66
TW-17	ND	ND	ND	ND	ND	47
TW-20	ND	ND	ND	ND	ND	66
Detection limit	0.01	0.05	0.02	0.001	0.01	0.1

Analysis for phenols and TOC. Castle AFB

Sample	Concentration, mg/L	
	<u>Phenols</u>	<u>TOC</u>
TW-12	ND	1.0
TW-13	ND	ND
TW-14	ND	ND
TW-15	ND	ND
TW-16	ND	ND
TW-17	ND	ND
TW-18	ND	ND
TW-20	ND	ND
Detection limit	0.1	1.0

LAB NO. 85-01-032

Analytical results for pesticides and herbicides. Castle AFB

Compound	Detection Limit ug/L	Concentration, ug/L				
		TW-12	TW-13	TW-15	TW-17	TW-20
Endrin	0.006	ND	ND	ND	ND	ND
Lindane	0.004	ND	ND	ND	ND	ND
Methoxychlor	0.2	ND	ND	ND	ND	ND
Toxaphene	0.25	ND	ND	ND	ND	ND
2,4-D	2	ND	ND	ND	ND	ND
2,4,5-TP	0.2	ND	ND	ND	ND	ND

CASTLE AFB

Oil and Grease Results

Sample No.	Weston Lab No.	Oil and Grease mg/L
PW-1	85-01-029-04	< 0.5
PW-2	85-01-029-09	1.0
PW-3	85-01-029-14	1.0
PW-5	85-01-029-19	< 0.5
PW-6	85-01-029-25	< 0.5
PW-7	85-01-029-31	1.0
PW-8	85-01-029-36	1.0
PW-10A	85-01-029-41	< 0.5
PW-10B	85-01-029-46	< 0.5
PW-11	85-01-029-51	< 0.5
TW-12	85-01-032-04	< 1.2
TW-13	85-01-032-13	< 1.3
TW-14	85-01-032-22	< 1.4
TW-15	85-01-032-32	< 1.5
TW-16	85-01-032-27	< 1.4
TW-17	85-01-032-41	14
TW-18	85-01-032-50	< 1.3
TW-20	85-01-032-55	< 1.4
MW 420	85-01-035-08	< 1.0
MW 450	85-01-035-02	< 1.1
MW 390	85-01-039-03	15
MW 400	85-01-039-11	3.8
MW 410	85-01-039-21	6.7
MW 440	85-01-039-31	3.5

Parameter	Detection Limit mg/L	Concentration, mg/L							
		MW210	MW211	MW230	MW240	MW320	MW330	MW340	FB-2
TOC	1.0	6.0	ND	2.0	ND	ND	ND	ND	ND
Phenolics	0.1	ND	ND	0.1	ND	ND	ND	ND	ND
Oil and Grease		< 1.0	< 1.0	< 1.2	< 1.0	< 1.4	2.4	< 1.3	2.7
Nitrate	0.1	-	-	1.4	18	18	22	20	ND
Cadmium	0.01	-	-	ND	ND	-	-	-	ND
Chromium	0.05	-	-	ND	ND	-	-	-	ND
Lead	0.02	-	-	ND	ND	-	-	-	ND
Mercury	0.001	-	-	ND	ND	-	-	-	ND
Silver	0.01	-	-	ND	ND	-	-	-	ND
					ug/L				
Endrin	0.006	-	-	ND	ND	-	-	-	ND
Lindane	0.004	-	-	ND	ND	-	-	-	ND
Methoxychlor	0.2	-	-	ND	ND	-	-	-	ND
Toxaphene	0.25	-	-	ND	ND	-	-	-	ND
2,4-D	0.2	-	-	ND	ND	-	-	-	ND
2,4,5-TP	0.02	-	-	ND	ND	-	-	-	ND

LAB NO. 85-02-006

Parameter	Detection Limit mg/L	Concentration, mg/L				
		MW220	MW290	MW300	MW310	MW311
TOC	1.0	ND	ND	ND	ND	ND
Phenolics	0.1	ND	-	-	-	-
Oil and Grease		< 1.1	< 1.1	< 1.2	1.2	2.5

LAB NO. 85-01-041

Parameter	Detection Limit mg/L	Concentration, mg/L				
		MW 350	MW360	MW370	MW380	MW470
TOC	1.0	ND	ND	ND	ND	ND
Phenolics	0.1	0.1	ND	0.1	ND	ND
Oil and Grease		< 1.3	5.8	5.3	9.7	5.1
Nitrate		29	55	47	49	12
Cadmium	0.01	ND	ND	ND	ND	ND
Chromium	0.05	ND	ND	ND	ND	ND
Lead	0.02	ND	ND	ND	ND	ND
Mercury	0.001	ND	ND	ND	ND	ND
Silver	0.01	ND	ND	ND	ND	ND
	<u>ug/L</u>			<u>ug/L</u>		
Endrin	0.006	ND	ND	ND	ND	ND
Lindane	0.004	ND	ND	ND	ND	ND
Methoxychlor	0.2	ND	ND	ND	ND	ND
Toxaphene	0.25	ND	ND	ND	ND	ND
2,4-D	0.2	ND	ND	ND	ND	ND
2,4,5-TP	0.02	ND	0.08	ND	0.06	0.08

Parameter	Detection Limit mg/L	Concentration, mg/L											TW-19	FB-1
		MW250	MW260	MW261	MW270	MW280	MW430	MW460	MW461					
TOC Phenolics Oil and Grease	1.0	ND	1.0	2.0	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND
	0.1	0.1	ND	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
		3.2	< 1.1	4.0	13	5.6	3.1	5.3	(1)	< 1.7	4.5			
Nitrate	0.1	74	41	41	43	15	-	12	12	27	ND		ND	ND
Cadmium	0.01	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
Chromium	0.05	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
Lead	0.02	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
Mercury	0.001	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
Silver	0.01	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
<u>ug/L</u>														
Endrin	0.006	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
Lindane	0.004	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
Methoxychlor	0.2	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
Toxaphene	0.25	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
2,4-D	0.2	ND	ND	ND	ND	ND	-	ND	ND	-	ND		ND	ND
2,4,5-TP	0.02	ND	0.06	ND	ND	ND	-	ND	ND	-	ND		ND	ND

(1) Oil and Grease on this extract was not measured since the seal on the vial was broken.

LAB NO. 85-01-035

Parameter	Detection Limit mg/L	Concentration, mg/L	
		MW420	MW450
TOC	1.0	ND	ND
Phenolics	0.1	ND	ND
Nitrate	0.1	36	39
Cadmium	0.01	ND	-
Chromium	0.05	ND	-
Lead	0.02	ND	-
Mercury	0.001	ND	-
Silver	0.01	ND	-
	<u>ug/L</u>		
Endrin	0.006	ND	-
Lindane	0.004	ND	-
Methoxychlor	0.2	ND	-
Toxaphene	0.25	ND	-
2,4-D	2	ND	-
2,4,5-TP	0.2	ND	-

Parameter	Detection Limit mg/L	Concentration, mg/L			
		MW 390	MW 400	MW 410	MW 440
TOC	1.0	ND	ND	1.0	ND
Phenolics	0.1	ND	ND	ND	ND
Nitrate	0.1	45	50	49	-
Cadmium	0.01	ND	ND	ND	-
Chromium	0.05	ND	ND	ND	-
Lead	0.02	ND	ND	ND	-
Mercury	0.001	ND	ND	ND	-
Silver	0.01	ND	ND	ND	-
	ug/L				
Endrin	0.006	ND	ND	ND	-
Lindane	0.004	ND	ND	ND	-
Methoxychlor	0.2	ND	ND	ND	-
Toxaphene	0.25	ND	ND	ND	-
2,4-D	2	ND	ND	ND	-
2,4,5-TP	0.2	ND	ND	ND	-



inter-office memorandum

TO: Fred Bopp
cc: Alison Dunn

DATE: March 29, 1985

FROM: David Ben-Hur

SUBJECT: Castle AFB - Results of analysis of surface W. O. No.: 0628-09-02
water samples.

Attached are the results of the analyses of the surface water samples which were collected on March 4. The TOC and phenols results are not yet available, and will be transmitted to you as soon as we have them.

Parameter	Detection Limit	Concentration												
		New PW	SG-1	SG-2	SG-3	SG-4	SG-5	SG-6	SG-6A	SG-7	SG-8	SG-9	SG-9A	
	mg/L													
Oil and Grease	0.5	0.9	1.3	1.5	1.2	0.7	0.7	1.5	1.7	2.0	0.9	0.7	0.6	
Nitrate	0.1	-	4.2	6.6	11	8.6	2.8	4.2	4.1	-	-	-	-	
Cadmium	0.01	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	
Chromium	0.05	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	
Lead	0.01	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	
Mercury	0.001	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	
Silver	0.01	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	
	ug/L													
TOX	5	ND	43	90	120	44	65	88	35	49	23	41	66	
Endrin	0.006	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	
Lindane	0.004	-	0.020	0.050	ND	ND	ND	ND	ND	-	-	-	-	
Methoxychlor	0.2	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	
Toxaphene	0.25	-	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	
2,4-D	0.06	-	ND	ND	ND	ND	0.11	2.4	2.2	-	-	-	-	
2,4,5-TP	0.02	-	ND	ND	ND	ND	ND	0.07	0.08	-	-	-	-	

Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Concentration, ug/L											
		New PW	SG-1	SG-2	SG-3	SG-4	SG-5	SG-6	SG-6A	SG-7	SG-8	SG-9	SG-9A
Chloromethane	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1,1-Trichloroethane	0.1	ND	ND	2.6	0.33	ND	2.2	0.10	ND	ND	ND	ND	0.11
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone (MEK)	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND



inter-office memorandum

TO: Katherine Sheedy

DATE: April 23, 1985

cc: Alison Dunn, Concord Office

FROM: David Ben-Hur

SUBJECT: Results of water analysis from Castle AFB

W. O. No.: 0628-09-02

Attached are the phenols and TOC results of analyses of water samples from Castle AFB, received on March 5, 1985.

RECEIVED

APR 24 1985

ROY F. WESTON, INC.
CONCORD OFFICE

TOC and Phenols results - Castle AFB water samples

	<u>Total Organic Carbon, mg/L</u>	<u>Phenols, mg/L</u>
Detection Limit	1.0	0.1
<u>Sample ID</u>		
New PW	ND	ND
SG-1	14	ND
SG-2	23	ND
SG-3	20	ND
SG-4	8.9	ND
SG-5	9.8	(1)
SG-6	17	(1)
SG-6A	18	ND
SG-7	23	-
SG-8	19	-
SG-9	14	-
SG-9A	(1)	-

(1) Samples were shipped to EAL and arrived broken.

Date of Final Report: March 1, 1985

WESTONCASTLE AIR FORCE BASE
TOX SUMMARY REPORT
W.O. NO. 0628-09-02

DATE SAMPLES COLLECTED: January 22, 1985

DATE SAMPLES RECEIVED: January 25, 1985

DATE ANALYZED: February 14, 1985

SAMPLES SUBMITTED BY: Kathy Schultz

R.F.W. NO.	SAMPLE DESCRIPTION	SAMPLE NUMBER	TOX, µg/L
8501-092-0010	PW-11	8501-029-50	21
-0020	PW-10A	8501-029-40	<5
-0030	PW-1	8501-029-03	<5
-0040	PW-2	8501-029-08	17
-0050	PW-8	8501-029-35	5
-0060	PW-3	8501-029-13	22
-0070	PW-5	8501-029-18	12
-0080	PW-10B	8501-029-45	6
-0090	PW-7	8501-029-30	<5
-0100	PW-6	8501-029-24	10
-0110	TW-12	8501-032-03	31
-0120	TW-13	8501-032-12	34
-0130	TW-14	8501-032-21	45
-0140	TW-15	8501-032-31	18
-0150	TW-16	8501-032-26	31
-0160	TW-17	8501-032-40	26
-0170	TW-18	8501-032-49	44
-0180	TW-20	8501-032-54	13

WESTON

CASTLE AIR FORCE BASE
TOX SUMMARY REPORT
W.O. NO: 0628-09-02

DATE SAMPLES COLLECTED: January 30, 1985

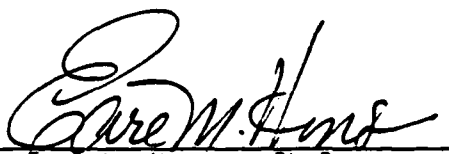
DATE OF ANALYSIS: February 1, 1985

DATE SAMPLES RECEIVED: February 1, 1985

SAMPLES SUBMITTED BY: Kathy Schultz

R.F.W. NO.	SAMPLE DESCRIPTION	SAMPLE NUMBER	TOX, $\mu\text{g/L}$
8502-120-0010	MW 250	8501-043-04	21
-0020	MW 261	8501-043-14	23
-0030	MW 270	8501-043-24	11
-0040	MW 460	8501-043-34	<5
-0050	MW 461	8501-043-44	13
-0060	FB-1	8501-043-54	11
-0070	MW 280	8501-043-64	13
-0080	TW-19	8501-043-74	<5
-0090	MW-430	8501-043-81	22
-0100	MW 260	8501-043-87	31

Approved By:



Earl M. Hansen, Ph.D.
Director
Analytical Lab



inter-office memorandum

TO: ALLISON DUNN
KASS SHEEDY
RICH JOHNSON
cc: EARL HANSEN

DATE: MAY 17, 1985

FROM: JUDY PORTA *JP*

SUBJECT: DATES OF ANALYSIS
CASTLE A.F.B. - TOX

W. O. No.: 0628-09-02

The following is a list of analysis dates for TOX samples sent to us from CASTLE A.F.B. For samples not listed below, the analysis date appeared in the body of the report.

R.F.W. NO.	PARAMETER	DATE OF ANALYSIS
8502-120-0010 to 0100	TOX	2-15-85
8504-393-0010 to 0150	TOX	4-17-85

If you have any questions, please don't hesitate to call.

Date of Final Report: March 1, 1985

WESTON

CASTLE AIR FORCE BASE (cont.)

DATE SAMPLES COLLECTED: January 31, 1985

DATE SAMPLES RECEIVED: February 4, 1985

DATE ANALYZED: February 14, 1985

SAMPLES SUBMITTED BY: Kathy Schultz

R.F.W. NO.	SAMPLE DESCRIPTION	SAMPLE NUMBER	TOX, µg/L
8502-138-0010	MW 210	8502-001-04	51
-0020	MW 211	8502-001-10	40
-0030	MW 230	8502-001-16	18
-0040	MW 240	8502-001-26	6
-0050	MW 320	8502-001-36	11
-0060	MW 330	8502-001-43	23
-0070	MW 340	8502-001-50	7
-0080	FB-2	8502-001-57	21

DATE SAMPLES COLLECTED: February 1, 1985

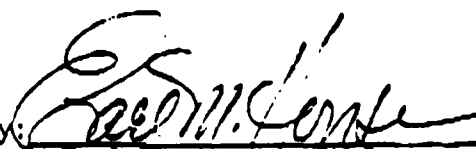
DATE SAMPLES RECEIVED: February 7, 1985

DATE ANALYZED: February 21, 1985

SAMPLES SUBMITTED BY: Kathy Schultz

R.F.W. NO.	SAMPLE DESCRIPTION	SAMPLE NUMBER	TOX, µg/L
8502-145-0010	MW 220	8502-006-04	37
-0020	MW 290	8502-006-10	15
-0030	MW 300	8502-006-15	26
-0040	MW 310	8502-006-20	20
-0050	MW 311	8502-006-25	18

Approved By:


Earl M. Hansen, Ph.D.
Manager

WESTON Analytical Laboratories



Date of Final Report: March 20, 1985

CASTLE AIR FORCE BASE
TOX SUMMARY REPORT
W.O. NO: 0628-09-02

DATE SAMPLES COLLECTED: March 4, 1985

Date Analyzed: March 13, 1985

DATE SAMPLES RECEIVED: March 7, 1985

SAMPLES SUBMITTED BY: Kathy Schultz

R.F.W. NO:	SAMPLE DESCRIPTION	SAMPLE NUMBER	TOX, ug/L
8503-252-0010	NEW PW	85-03-004-04	<5
8503-252-0020	SG-1	85-03-004-10	43
8503-252-0030	SG-2	85-03-004-21	90
8503-252-0040	SG-3	85-03-004-32	121
8503-252-0050	SG-4	85-03-004-43	44
8503-252-0060	SG-5	85-03-004-54	65
8503-252-0070	SG-6	85-03-004-65	88
8503-252-0080	SG-6A	85-03-004-76	35
8503-252-0090	SG-7	85-03-004-87	49
8503-252-0100	SG-8	85-03-004-92	23
8503-252-0110	SG-9	85-03-004-97	41
8503-252-0120	SG-9A	85-03-004-102	66

Approved by:

Earl M. Hansen, Ph.D.

Manager

WESTON Analytical Laboratories

L.4 ROUND 2 WATER SAMPLES: DATA REPORTS

inter-office memorandum

TO: Katherine Sheedy

DATE: May 6, 1985

FROM: David Ben-Hur, Stockton Laboratory

SUBJECT: Analysis of water samples from Castle AFB W. O. No.: 0628-09-02
sampled during April 1985.

Attached are the available results on the analyses of water samples from Castle. The values for the following parameters are included for all the samples:

- a. Volatiles by Methods 601 and 602
- b. Pesticides and Herbicides
- c. Nitrate
- d. Metals

For TOX the results reported are only partial, the remainder will be reported as soon as they are available from the Lionville laboratory.

The results for Oil and Grease, for TOC, and for Phenols have not yet been received from EAL. These will be reported as soon as they are available.

Samples W-1, W-2, and W-3 were aimed at comparing the effects of sampling techniques on concentrations of volatiles in the samples. These samples were run both by GC using methods 601 & 602 and by GC/MS using Method 624, and the results of the two techniques are not identical. The following table compares the two sets, listing only compounds detected in the samples. All numerical values are in units of ug/L.

Compound	W-1 ⁽¹⁾		W-2 ⁽¹⁾		W-3 ⁽¹⁾	
	GC	GC/MS	GC	GC/MS	GC	GC/MS
1,1,-Dichloroethane	0.54	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.44	2.2	0.72	ND	0.30	Tr
Chloroform	ND	0.5	ND	ND	ND	0.7
1,2-Dichloroethane	ND	ND	ND	Tr	ND	2.3
1,1,1-Trichloroethane	ND	5.2	ND	4.8	ND	ND
Trichloroethene	150	150	2.1	1.9	260	109
1,1,2,2-Tetrachloroethane	ND	11	ND	0.6	ND	9.9
Tetrachloroethene	ND	13	ND	0.7	41	11
Benzene	2.7	ND	0.61	ND	ND	ND
Chlorobenzene	24	ND	0.36	Tr	ND	ND
Ethylbenzene	ND	ND	ND	1.3	ND	ND

These results show a significant disparity among them. In general, the samples showed a large number of peaks. Under such circumstances, the GC/MS results are more reliable because the manner in which the components are identified and quantitated is more characteristic of the component than the GC method. It is believed that where a component was found by GC, but not by GC/MS, the GC identification is erroneous; the exception to this would be those components that were found in the sub-ppb level.

-
- (1) Samples W-1, W-2, and W-3 were all collected from MW-210 on 5 April 1985. W-1 was bailed, W-2 was pumped through a teflon line with a faulty valve, and W-3 was pumped through a teflon line with the valve operating properly.

CASTLE AFB - April 1985 Sampling
Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L			
		MW400	MW420	MW440	MW451
Chloromethane	1.0	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.1	ND	3.6	ND	ND
Chloroform	0.1	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	0.67	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND
Trichloroethene	0.1	ND	0.33	8.3	ND
Dibromochloromethane	0.1	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	0.70	0.57
Chlorobenzene	0.3	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration						
			MW350	MW360	MW370	MW371	MW380	MW400	MW420
Nitrate	0.1	mg/L	27	55	44	44	47	21	30
Total Org. Halogen (TOX)	5	ug/L	14	17	31	15	5	6	11
Cadmium	10	ug/L	ND	ND	ND	ND	ND	ND	ND
Chromium	50	ug/L	ND	ND	ND	ND	ND	ND	ND
Lead	20	ug/L	ND	ND	ND	ND	ND	ND	ND
Mercury	1	ug/L	ND	ND	ND	ND	ND	ND	ND
Silver	10	ug/L	ND	ND	ND	ND	ND	ND	ND
Endrin	0.02	ug/L	ND	ND	ND	ND	ND	ND	ND
Lindane	0.01	ug/L	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	0.2	ug/L	ND	ND	ND	ND	ND	ND	ND
Toxaphene	1	ug/L	ND	ND	ND	ND	ND	ND	ND
2,4-D	0.06	ug/L	ND	ND	ND	ND	ND	ND	ND
2,4,5-TP	0.06	ug/L	ND	ND	ND	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration		
			MW 440	MW450	MW451
Nitrate	0.1	mg/L	--	41	41
Total Org. Halogen (TOX)	5	ug/L	5	6	5
Cadmium	10	ug/L	-	-	-
Chromium	50	ug/L	-	-	-
Lead	20	ug/L	-	-	-
Mercury	1	ug/L	-	-	-
Silver	10	ug/L	=	-	-
Endrin	0.02	ug/L	-	-	-
Lindane	0.01	ug/L	-	-	-
Methoxychlor	0.2	ug/L	-	-	-
Toxaphene	1	ug/L	-	-	-
2,4-D	0.06	ug/L	-	-	-
2,4,5-TP	0.06	ug/L	-	-	-

CASTLE AFB - April 1985 Sampling
 Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L			
		MW230	MW240	MW241	MW250
Chloromethane	1.0	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.1	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND
Trichloroethene	0.1	3.4	ND	ND	0.23
Dibromochloromethane	0.1	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration						
			FB-2	TW-19	MW230	MW240	MW241	MW250	MW260
Nitrate	0.1	mg/L	0.2	26	7.7	13	13	72	33
Total Org. Halogen (TOX)	5	ug/L	11	14	13	7	8	39	13
Cadmium	10	ug/L	ND	-	ND	ND	ND	ND	ND
Chromium	50	ug/L	ND	-	ND	ND	ND	ND	ND
Lead	20	ug/L	ND	-	ND	ND	ND	ND	ND
Mercury	1	ug/L	ND	-	ND	ND	ND	ND	ND
Silver	10	ug/L	ND	-	ND	ND	ND	ND	ND
Endrin	0.02	ug/L	ND	-	ND	ND	ND	ND	ND
Lindane	0.01	ug/L	ND	-	ND	ND	ND	ND	ND
Methoxychlor	0.2	ug/L	ND	-	ND	ND	ND	ND	ND
Toxaphene	1	ug/L	ND	-	ND	ND	ND	ND	ND
2,4-D	0.06	ug/L	ND	-	ND	ND	ND	ND	ND
2,4,5-TP	0.06	ug/L	ND	-	ND	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration		
			MW390	MW460	MW470
Nitrate	0.1	mg/L	13	12	12
Total Org. Halogen (TOX)	5	ug/L	ND	ND	13
Cadmium	10	ug/L	ND	ND	ND
Chromium	50	ug/L	ND	ND	ND
Lead	20	ug/L	ND	ND	ND
Mercury	1	ug/L	ND	ND	ND
Silver	10	ug/L	ND	ND	ND
Endrin	0.02	ug/L	ND	ND	ND
Lindane	0.01	ug/L	ND	ND	ND
Methoxychlor	0.2	ug/L	ND	ND	ND
Toxaphene	1	ug/L	ND	ND	ND
2,4-D	0.06	ug/L	ND	ND	ND
2,4,5-TP	0.06	ug/L	ND	ND	ND

CASTLE AFB - April 1985 Sampling
 Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L			
		FB-1	MW220	MW221	MW270 MW280
Chloromethane	1.0	ND	ND	ND	ND ND
Bromomethane	1.2	ND	ND	ND	ND ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND ND
Vinyl chloride	0.2	ND	ND	ND	ND ND
Chloroethane	0.5	ND	ND	ND	ND ND
Methylene chloride	0.2	ND	ND	ND	ND ND
Trichlorofluoromethane		ND	ND	ND	ND ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND ND
trans-1,2-Dichloroethene	0.1	ND	ND	ND	ND ND
Chloroform	0.1	ND	ND	ND	ND ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND ND
Carbon tetrachloride	0.1	ND	ND	ND	ND ND
Bromodichloromethane	0.1	ND	ND	ND	ND ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND ND
Trichloroethene	0.1	ND	ND	ND	ND ND
Dibromochloromethane	0.1	ND	ND	ND	ND ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND ND
Bromoform	0.2	ND	ND	ND	ND ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND ND
Tetrachloroethene	0.05	ND	ND	ND	ND ND
Chlorobenzene	0.3	ND	ND	ND	ND ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND ND
Benzene	0.2	ND	ND	ND	ND ND
Toluene	0.2	ND	ND	ND	ND ND
Ethylbenzene	0.2	ND	ND	ND	ND ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND ND

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration						
			FB-1	MW220	MW221	MW270	MW280	MW290	MW320
Nitrate	0.1	mg/L	0.1	-	-	45	15	-	18
Total Org. Halogen (TOX)	5	ug/L	7	26	29	18	5	5	ND
Cadmium	10	ug/L	ND	-	-	ND	ND	-	-
Chromium	50	ug/L	ND	-	-	ND	ND	-	-
Lead	20	ug/L	ND	-	-	ND	ND	-	-
Mercury	1	ug/L	ND	-	-	ND	ND	-	-
Silver	10	ug/L	ND	-	-	ND	ND	-	-
Endrin	0.02	ug/L	ND	-	-	ND	ND	-	-
Lindane	0.01	ug/L	ND	-	-	ND	ND	-	-
Methoxychlor	0.2	ug/L	ND	-	-	ND	ND	-	-
Toxaphene	1	ug/L	ND	=	-	ND	ND	-	-
2,4-D	0.06	ug/L	ND	-	-	ND	ND	-	-
2,4,5-TP	0.06	ug/L	ND	-	-	ND	ND	-	-

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration		
			MW330	MW331	MW340
Nitrate	0.1	mg/L	21	21	20
Total Org. Halogen (TOX)	5	ug/L	13	ND	18
Cadmium	10	ug/L	-	-	-
Chromium	50	ug/L	-	-	-
Lead	20	ug/L	-	-	-
Mercury	1	ug/L	-	-	-
Silver	10	ug/L	-	-	-
Endrin	0.02	ug/L	-	-	-
Lindane	0.01	ug/L	-	-	-
Methoxychlor	0.2	ug/L	-	-	-
Toxaphene	1	ug/L	-	-	-
2,4-D	0.06	ug/L	-	-	-
2,4,5-TP	0.06	ug/L	-	-	-

CASTLE AFB - April 1985 Sampling
 Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L			
		MW210	MW410	W-1	W-2 W-3
Chloromethane	1.0	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND
Vinyl chloride	0.2	ND	2.2	ND	ND
Chloroethane	0.5	ND	1.2	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	0.54	ND	ND
trans-1,2-Dichloroethene	0.1	0.60	0.44	0.72	0.30
Chloroform	0.1	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	0.82	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND
trans-1,3-Dichloropropene	0.3	ND	0.63	ND	ND
Trichloroethene	0.1	230	0.54	150	260
Dibromochloromethane	0.1	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND
Tetrachloroethene	0.05	37	ND	ND	41
Chlorobenzene	0.3	ND	24	0.36	ND
1,3-Dichlorobenzene	0.3	ND	2.0	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND
Benzene	0.2	0.38	0.34	2.7	0.61
Toluene	0.2	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration				
			MW210	MW300	MW301	MW310	MW410
Nitrate	0.1	mg/L	-	-	-	-	22
Total Org. Halogen (TOX)	5	ug/L	45	11	13	10	13
Cadmium	10	ug/L	-	-	-	-	ND
Chromium	50	ug/L	-	-	-	-	ND
Lead	20	ug/L	-	-	-	-	ND
Mercury	1	ug/L	-	-	-	-	ND
Silver	10	ug/L	-	-	-	-	ND
Endrin	0.02	ug/L	-	-	-	-	ND
Lindane	0.01	ug/L	-	-	-	-	ND
Methoxychlor	0.2	ug/L	-	-	-	-	ND
Toxaphene	1	ug/L	-	-	-	-	ND
2,4-D	0.06	ug/L	-	-	-	-	ND
2,4,5-TP	0.06	ug/L	-	-	-	-	ND

CASTLE AFB - April 1985 Sampling
 Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L					
		SG-1	SG-2	SG-3	SG-4	SG-5	SG-5A SG-6
Chloromethane	1.0	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.1	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND	ND	ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND
Benzene	0.2	0.66	0.22	0.33	0.34	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling
 Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L			
		SG-7	SG-7A	SG-8	SG-9
Chloromethane	1.0	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.1	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND
Trichloroethene	0.1	2.0	2.2	0.25	ND
Dibromochloromethane	0.1	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND
Ethylbenzene	0.2	0.26	0.21	ND	ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration						
			SG-1	SG-2	SG-3	SG-4	SG-5	SG-5A	SG-6
Nitrate	0.1	mg/L	0.2	0.1	ND	0.7	0.5	0.5	1.0
Total Org. Halogen (TOX)	5	ug/L							
Cadmium	10	ug/L	ND	ND	ND	ND	ND	ND	ND
Chromium	50	ug/L	ND	ND	ND	ND	ND	ND	ND
Lead	20	ug/L	ND	ND	ND	ND	ND	ND	ND
Mercury	1	ug/L	ND	ND	ND	ND	ND	ND	ND
Silver	10	ug/L	ND	ND	ND	ND	ND	ND	ND
Endrin	0.02	ug/L	ND	ND	ND	ND	ND	ND	ND
Lindane	0.01	ug/L	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	0.2	ug/L	ND	ND	ND	ND	ND	ND	ND
Toxaphene	1	ug/L	ND	ND	ND	ND	ND	ND	ND
2,4-D	0.06	ug/L	ND	0.54	0.28	ND	ND	ND	ND
2,4,5-TP	0.06	ug/L	ND	ND	ND	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling
 Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L						
		New PW	PW-1	PW-2	PW-3	PW-4	PW-5	PW-5A
Chloromethane	1.0	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.1	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	26	ND	ND	0.26	0.46	1.2	40
1,1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	ND	12	20	44	32	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND	ND	ND	ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND	ND
1,1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	1.0	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2	0.23	0.21	ND	ND	0.22	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling
Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L			
		PW-6	PW-7	PW-8	PW-8A PW-11
Chloromethane	1.0	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.1	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	2.6	ND	ND	26
Carbon tetrachloride	0.1	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND
Trichloroethene	0.1	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration				
			PW-4	PW-5	PW-5A	PW-6	PW-11
Nitrate	0.1	mg/L	23	18	18	18	17
Total Org. Halogen (TOX)	5	ug/L					
Cadmium	10	ug/L	ND	-	-	-	-
Chromium	50	ug/L	ND	-	-	-	-
Lead	20	ug/L	ND	-	-	-	-
Mercury	1	ug/L	ND	-	-	-	-
Silver	10	ug/L	ND	-	-	-	-
Endrin	0.02	ug/L	ND	-	-	-	-
Lindane	0.01	ug/L	ND	-	-	-	-
Methoxychlor	0.2	ug/L	ND	-	-	-	-
Toxaphene	1	ug/L	ND	-	-	-	-
2,4-D	0.06	ug/L	ND	-	-	-	-
2,4,5-TP	0.06	ug/L	ND	-	-	-	-

CASTLE AFB - April 1985 Sampling
Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L				
		TW-12	TW-13	TW-14	TW-15	TW-16 TW-17
Chloromethane	1.0	ND	ND	ND	ND	ND ND
Bromomethane	1.2	ND	ND	ND	ND	ND ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND ND
Vinyl chloride	0.2	ND	0.22	ND	ND	ND 0.22
Chloroethane	0.5	ND	ND	ND	ND	ND 3.4
Methylene chloride	0.2	ND	ND	ND	ND	ND ND
Trichlorofluoromethane		ND	ND	ND	ND	ND ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND ND
1,1-Dichloroethane	0.1	ND	ND	1.7	ND	ND 32
trans-1,2-Dichloroethene	0.1	ND	1.0	2.8	0.38	ND 0.98
Chloroform	0.1	ND	ND	ND	ND	ND ND
1,2-Dichloroethane	0.02	DN	ND	ND	ND	ND ND
1,1,1-Trichloroethane	0.1	1.2	ND	ND	18	0.42 20
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND	ND ND
Trichloroethene	0.1	ND	100	280	39	160 110
Dibromochloromethane	0.1	ND	ND	ND	ND	ND ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND	ND ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND	ND ND
Bromoform	0.2	ND	ND	ND	ND	ND ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND ND
Tetrachloroethene	0.05	1.2	ND	0.73	ND	ND ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND ND
Benzene	0.2	ND	ND	0.79	ND	ND ND
Toluene	0.2	ND	ND	ND	ND	ND ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND	ND ND

CASTLE AFB - April 1985 Sampling
Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L					
		TW-18	TW-21	MW360	MW370	MW380	MW390
Chloromethane	1.0	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	4.0	20	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.1	1.3	4.2	ND	ND	ND	ND
Chloroform	0.1	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	21	ND	ND	ND	ND	22
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	1.5	ND	ND	1.9
trans-1,3-Dichloropropene	0.3	ND	ND	1.3	ND	ND	1.3
Trichloroethene	0.1	150	130	ND	ND	ND	ND
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND	ND	ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	ND	ND	ND	0.41	0.31
Toluene	0.2	ND	ND	0.23	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling

Parameter	Detection Limit	Units	Concentration			
			TW-12	TW-13	TW-15	TW-17
Nitrate	0.1	mg/L	65	57	62	46
Total Org. Halogen (TOX)	5	ug/L				
Cadmium	10	ug/L	ND	ND	ND	ND
Chromium	50	ug/L	ND	ND	ND	ND
Lead	20	ug/L	ND	ND	ND	ND
Mercury	1	ug/L	ND	ND	ND	ND
Silver	10	ug/L	ND	ND	ND	ND
Endrin	0.02	ug/L	ND	ND	ND	ND
Lindane	0.01	ug/L	ND	ND	ND	ND
Methoxychlor	0.2	ug/L	ND	ND	ND	ND
Toxaphene	1	ug/L	ND	ND	ND	ND
2,4-D	0.06	ug/L	ND	ND	ND	ND
2,4,5-TP	0.06	ug/L	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling
 Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L					
		FB-2	TW-19	MW290	MW300	MW301	MW310
Chloromethane	1.0	ND	ND	ND	ND	ND	ND
Bromomethane	1.2	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND	ND
Chloroethane	0.5	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane		ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1	ND	ND	ND	2.2	ND	ND
trans-1,2-Dichloroethene	0.1	0.66	ND	ND	ND	ND	2.0
Chloroform	0.1	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	22	ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1	0.17	ND	0.98	59	43	70
Dibromochloromethane	0.1	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND	ND	ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND	ND	ND
Bromoform	0.2	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05	0.32	ND	ND	0.34	ND	ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND	ND
Benzene	0.2	ND	0.31	0.23	ND	ND	ND
Toluene	0.2	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND	ND	ND

CASTLE AFB - April 1985 Sampling
Volatiles Analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit, ug/L	Concentration, ug/L				
		MW330	MW331	MW340	MW350	MW460 MW470
Chloromethane	1.0	ND	ND	ND	ND	ND ND
Bromomethane	1.2	ND	ND	ND	ND	ND ND
Dichlorodifluoromethane	1.8	ND	ND	ND	ND	ND ND
Vinyl chloride	0.2	ND	ND	ND	ND	ND ND
Chloroethane	0.5.	ND	ND	ND	ND	ND ND
Methylene chloride	0.2	ND	ND	ND	ND	ND ND
Trichlorofluoromethane		ND	ND	ND	ND	ND ND
1,1-Dichloroethene	0.2	ND	ND	ND	ND	ND ND
1,1-Dichloroethane	0.1	ND	ND	ND	ND	ND ND
trans-1,2-Dichloroethene	0.1	ND	ND	ND	ND	ND ND
Chloroform	0.1	ND	ND	ND	ND	ND ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND ND
1,1,1-Trichloroethane	0.1	ND	ND	ND	ND	ND ND
Carbon tetrachloride	0.1	ND	ND	ND	ND	ND ND
Bromodichloromethane	0.1	ND	ND	ND	ND	ND ND
1,2-Dichloropropane	0.1	ND	ND	ND	ND	ND ND
trans-1,3-Dichloropropene	0.3	ND	ND	ND	ND	ND ND
Trichloroethene	0.1	6.3	5.6	ND	ND	ND 45
Dibromochloromethane	0.1	ND	ND	ND	ND	ND ND
1,1,2-Trichloroethane	0.05	ND	ND	ND	ND	ND ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND	ND	ND ND
2-Chloroethyl vinyl ether	0.2	ND	ND	ND	ND	ND ND
Bromoform	0.2	ND	ND	ND	ND	ND ND
1,1,2,2-Tetrachloroethane	0.05	ND	ND	ND	ND	ND ND
Tetrachloroethene	0.05	ND	ND	ND	ND	ND ND
Chlorobenzene	0.3	ND	ND	ND	ND	ND ND
1,3-Dichlorobenzene	0.3	ND	ND	ND	ND	ND ND
1,2-Dichlorobenzene	0.2	ND	ND	ND	ND	ND ND
1,4-Dichlorobenzene	0.2	ND	ND	ND	ND	ND ND
Benzene	0.2	ND	ND	ND	ND	ND ND
Toluene	0.2	ND	ND	ND	ND	ND ND
Ethylbenzene	0.2	ND	ND	ND	ND	ND ND
2-Butanone (MEK)	1.0	ND	ND	ND	ND	ND ND



Date of Report: April 23, 1985

CASTLE A.F.B.
TOX SUMMARY REPORT
FOR
SAMPLES RECEIVED APRIL 5, 1985
W.O. NO. 0628-09-02

Date Samples Collected: April 2-3, 1985
Samples Submitted By: Kathy Schultz

R.F.W. NO.	SAMPLE DESCRIPTION	TOX, ug/L
8504-370-0010	MW350	14
-0020	MW360	17
-0030	MW370	31
-0040	MW371	15
-0050	MW380	5
-0060	MW400	6
-0070	MW420	11
-0080	MW440	5
-0090	MW450	6
-0100	MW451	5
-0110	FB-2	11
-0120	TW-19	14
-0130	MW230	13
-0140	MW240	7
-0150	MW241	8
-0160	MW250	39
-0170	MW260	13
-0180	MW390	< 5
-0190	MW460	< 5
-0200	MW470	13



inter-office memorandum

TO: Allison Dunn
Kass Sheedy
Rich Johnson
cc: Earl Hansen

DATE: May 22, 1985

FROM: Judy Porta *JP*

SUBJECT: DATES OF ANALYSIS
CASTLE A.F.B. - TOX BATCH 8504-370/

W. O. No.: 0628-09-02

The following is a list of dates of analysis for the above-referenced batch:

<u>R.F.W. NO.</u>	<u>PARAMETER</u>	<u>DATE OF ANALYSIS</u>
8504-370-0010 to 0030	TOX	4-16-85
8504-370-0040	TOX	4-22-85
8504-370-0050 to 0200	TOX	4-16-85

JP/eb



Date of Report: April 19, 1985

CASTLE A.F.B.
TOX SUMMARY REPORT
FOR
SAMPLES RECEIVED APRIL 11, 1985
W.O. NO. 0628-09-02

Date Samples Collected: April 4-5, 1985
Samples Submitted By: Kathy Schultz

DATE OF ANALYSIS: APRIL 17, 1985

R.F.W. NO.	SAMPLE DESCRIPTION	TOX,ug/L
8504-393-0010	FB-1	7
-0020	MW220	26
-0030	MW221	29
-0040	MW270	18
-0050	MW280	5
-0060	MW290	5
-0070	MW320	< 5
-0080	MW330	13
-0090	MW331	< 5
-0100	MW340	18
-0110	MW210	45
-0120	MW300	11
-0130	MW301	13
-0140	MW310	10
-0150	MW410	13

APPROVED BY:

Earl M. Hansen, Ph.D.
Manager

WESTON Analytical Laboratories

WESTON

inter-office memorandum

TO: ALLISON DUNK
KASS SHEEDY
RICH JOHNSON
cc: EARL HANSEN

DATE: MAY 17, 1985

FROM: JUDY PORTA *JP*

SUBJECT: DATES OF ANALYSIS
CASTLE A.F.B. - TOX

W. O. No.: 0628-09-02

The following is a list of analysis dates for TOX samples sent to us from CASTLE A.F.B. For samples not listed below, the analysis date appeared in the body of the report.

<u>R.F.W. NO.</u>	<u>PARAMETER</u>	<u>DATE OF ANALYSIS</u>
8502-120-0010 to 0100	TOX	2-15-85
8504-393-0010 to 0150	TOX	4-17-85

If you have any questions, please don't hesitate to call.



Date of Report: May 14, 1985

CASTLE A.F.B.
TOX SUMMARY REPORT
FOR
SAMPLES REC'D APRIL 16, 1985
W.O. NO. 0628-09-02

a)

R.F.W. NO.	SAMPLE DESCRIPTION	DATE SAMPLE COLLECTED	DATE REC'D	DATE ANALYZED	TOX,ug/L
8504-411-0010	NEW PW	4-9-85	4-16-85	4-19-85	19
-0020	PW-1	4-9-85	4-16-85	4-19-85	7
-0030	PW-2	4-9-85	4-16-85	4-19-85	14
-0040	PW-3	4-9-85	4-16-85	4-19-85	7
-0050	PW-4	4-9-85	4-16-85	4-19-85	19
-0060	PW-5	4-9-85	4-16-85	4-19-85	9
-0070	PW-5A	4-9-85	4-16-85	4-19-85	< 5
-0080	PW-6	4-9-85	4-16-85	4-19-85	< 5
-0080 SPIKE	PW-6 SPIKE	4-9-85	4-16-85	4-19-85	112% RECOVERY
-0090	PW-7	4-9-85	4-16-85	4-29-85	< 5
-0100	PW-8	4-9-85	4-16-85	4-25-85	57
-0110	PW-8A	4-9-85	4-16-85	4-25-85	31
-0120	PW-11	4-9-85	4-16-85	4-25-85	< 5
-0130	SG-11	4-8-85	4-16-85	4-25-85	6
-0140	SG-1	4-8-85	4-16-85	4-26-85	123
-0150	SG-2	4-8-85	4-16-85	4-26-85	31
-0160	SG-3	4-8-85	4-16-85	4-26-85	79
-0170	SG-4	4-8-85	4-16-85	4-26-85	35
-0180	SG-5	4-8-85	4-16-85	4-26-85	52
-0180 DUP	SG-5 LAB DUP	4-8-85	4-16-85	4-26-85	41
-0190	SG-5A	4-8-85	4-16-85	4-26-85	22
-0200	SG-6	4-8-85	4-16-85	4-26-85	43
-0210	SG-7	4-8-85	4-16-85	4-26-85	24
-0220	SG-7A	4-8-85	4-16-85	4-26-85	31
-0230	SG-8	4-8-85	4-16-85	4-26-85	39
-0240	SG-9	4-8-85	4-16-85	4-26-85	27
-0240 SPIKE	SG-9 SPIKE	4-8-85	4-16-85	4-26-85	91% RECOVERY



Date of Report: May 8, 1985

CASTLE A.F.B.
TOX SUMMARY REPORT
FOR
SAMPLES REC'D APRIL 18, 1985
W.O. NO. 0628-09-02

Date Samples Collected: April 10, 1985
Samples Submitted By: Kathy Schultz

Date Analyzed: May 6, 1985

R.F.W. NO.	SAMPLE DESCRIPTION	TOX, μ g/L
8504-418-0010	TW-12	11
-0020	TW-13	25
-0030	TW-14	46
-0040	TW-15	16
-0050	TW-16	22
-0060	TW-17	26
-0070	TW-18	44
-0080	TW-21	26
-0090	TW-430	< 5

Approved By:

Earl M. Hansen, Ph.D.
Manager
WESTON Analytical Laboratories



inter-office memorandum

TO: Katherine Sheedy

DATE: May 21, 1985

cc: Alison Dunn, Concord Office

FROM: David Ben-Hur

SUBJECT: Castle AFB

W. O. No.: 0628-09-02

Attached are some of the TOC and phenols results on water samples from Castle AFB.

I have also attached the information requested concerning the chronology of the extractions and analysis.

MAY 21 1985

CASTLE AFB - TOC and Phenol Results

<u>Sample ID</u>	<u>TOC, mg/L</u>	<u>Phenols, mg/L</u>
MW350	ND	ND
MW360	ND	ND
MW370	ND	ND
MW371	ND	ND
MW380	1	ND
MW400	2	ND
MW420	ND	ND
MW440	ND	ND
MW450	2	ND
MW451	ND	ND
FB-2	ND	ND
TW-19	ND	ND
MW230	2	ND
MW240	ND	ND
MW241	2	ND
MW250	2	ND
MW260	2	ND
MW390	ND	ND
MW460	3	ND
MW470	ND	ND
Detection Limit	1	0.1



inter-office memorandum

TO: Katherine Sheedy

DATE: May 28, 1985

cc: Alison Dunn

FROM: David Ben-Hur, Stockton Laboratory

DB

SUBJECT: Castle AFB, Analytical results

W. O. No.: 0628-09-02

Attached are the remaining results for the analyses of the samples collected at Castle AFB during March and April 1985. I should have the chronology of the analyses at EAL on Thursday of this week.

CASTLE AFB - Oil and Grease Results
Sampling of March and April 1985

Lab Job No.	Sample ID	Oil and Grease, mg/L
	Detection Limit	0.1
85-04-004	MW350	ND
	MW360	0.4
	MW370	2.8
	MW371	4.4
	MW380	1.3
	MW400	0.5
	MW420	0.5
	MW440	ND
	MW450	ND
	MW451	0.8
85-04-006	FB-2	ND
	TW-19	0.5
	MW230	2.5
	MW240	1.0
	MW241	0.8
	MW250	0.6
	MW260	0.6
	MW390	0.8
	MW460	0.8
	MW470	ND
85-04-008	FB-1	ND
	MW220	ND
	MW221	ND
	MW270	ND
	MW280	0.8
	MW290	ND
	MW320	ND
	MW330	ND
	MW331	0.6
	MW340	ND
85-04-012	MW210	0.5
	MW300	0.4
	MW301	1.0
	MW310	0.6
	MW410	1.0
85-04-015	SG-1	1.0
	SG-2	ND
	SG-3	0.9
	SG-4	ND
	SG-5	0.4
	SG-5A	ND

CASTLE AFB - Oil and Grease Results
Sampling of March and April 1985

Lab Job No.	Sample ID	Oil and Grease, mg/L
85-04-015	SG-6	0.5
	SG-7	0.5
	SG-7A	0.5
	SG-8	ND
	SG-9	ND
85-04-017	New PW	0.9
	PW-1	ND
	PW-2	ND
	PW-3	0.7
	PW-4	ND
	PW-5	1.0
	PW-5A	1.5
	PW-6	ND
	PW-7	*
	PW-8	0.8
	PW-8A	*
	PW-11	ND
85-04-020	TW-12	ND
	TW-13	ND
	TW-14	ND
	TW-15	ND
	TW-16	*
	TW-17	14.
	TW-18	ND
	TW-21	ND
	MW430	ND

*) Container broke during analysis. Results are not available.

CASTLE AFB - TOC and Phenols
March and April 1985

Lab Job No.	Sample ID	Phenols mg/L	TOC mg/L
	Detection Limit	0.1	1.0
85-04-020	TW-12	ND	ND
	TW-13	ND	1.3
	TW-14	ND	ND
	TW-15	ND	ND
	TW-16	ND	ND
	TW-17	ND	1.5
	TW-18	ND	ND
	TW-21	ND	ND
	MW430	ND	ND
85-04-008	FB-1	ND	ND
	MW220	ND	ND
	MW221	ND	ND
	MW270	ND	1.2
	MW280	ND	ND
	MW290	ND	1.2
	MW320	ND	ND
	MW330	ND	ND
	MW331	ND	ND
	MW340	ND	ND
85-04-012	MW210	ND	ND
	MW300	ND	ND
	MW301	ND	ND
	MW310	ND	1.1
	MW410	ND	ND
85-04-015	SG-1	ND	33.
	SG-2	ND	13.
	SG-3	ND	34.
	SG-4	ND	7.3
	SG-5	ND	7.4
	SG-5A	ND	7.0
	SG-6	ND	8.4
	SG-7	ND	10.
	SG-7A	ND	9.0
	SG-8	ND	14.
	SG-9	ND	20.
85-04-017	New PW	ND	ND
	PW-1	ND	ND
	PW-2	ND	ND
	PW-3	ND	ND
	PW-4	ND	ND

CASTLE AFB - TOC and Phenols
March and April 1985

<u>Lab Job No.</u>	<u>Sample ID</u>	<u>Phenols</u> <u>mg/L</u>	<u>TOC</u> <u>mg/L</u>
85-04-017	PW-5	ND	1.0
	PW-5A	ND	1.0
	PW-6	ND	1.8
	PW-7	ND	ND
	PW-8	ND	ND
	PW-8A	ND	1.0
	PW-11	ND	ND

L.5 LABORATORY QA/QC REPORTS



inter-office memorandum

TO: [REDACTED]
FRED BOPP, III

DATE: 1-29-85

FROM: DAVID BEN-HUR

SUBJECT:

W. O. No.:

Attached are the analytical results on the samples from the pump test performed on January 21, 1985.

DBH:le

CLIENT: Air Force (Castle)
WORK ORDER NO: 0628-09-02
TEST: Pump Test
LABORATORY NO: 85-01-025

A sample of water was spiked with trichloroethene (TCE) to test losses during pump operations. The circulated water was submitted for TCE analysis with the following results:

<u>SAMPLE IDENTIFICATION</u>	<u>TCE, ug/l</u>
Spike	80
FB-1	0.25
FB-2	< 0.12
FB-3	0.12
Tank	0.47

The testing was performed on January 21, 1985. The method was EPA Method 601.

inter-office memorandum

TO: Katherine Sheedy

DATE: June 6, 1985

cc: Alison Dunn, Concord Office

FROM: David Ben-Hur, Stockton Office *DB*

SUBJECT: Castle AFB

W. O. No.: 0628-09-02

Attached are the second column confirmation data for the volatiles and for pesticides and herbicides. Second column verification was run only when a measurable quantity of the target components were found.

In evaluating the data for the volatiles, it should be noted that the second column does not separate 1,1,1-trichloroethane from trichloroethene. In any sample where both compounds were initially found, they are reported together in the analysis by the second column, and they are entered according to the compound that was found in greater quantity in the original measurement.

In several instances compounds were found in the second column confirmation analysis that were not present originally. Most notably, trans-1,2-dichloroethene has been found. This is not likely to be a contamination since the compound is not found in the laboratory, except for the standard. Conceivably it is due to degradation of some other chlorinated compound in the sample.

In addition to the second column confirmation information, data concerning dates of analysis are included. I am still working on pulling together the data for spikes and duplicate runs where they were done and will report these shortly.

CASTLE AFB

DETECTION LIMITS

1. Oil and Grease

The detection limit for oil and grease by Method 413.2 is 1 mg/L (1,000 ug/L). Without modifying the method, the detection limit cannot be as required by the contract.

On the first round of water sampling at Castle AFB, the samples were subjected to Method 413.2 without any deviation, resulting in reported values of 1 mg/L, and occasionally even higher because the sample size was smaller than 1 liter as required by the method. The method was also adhered to in the second round; however, the extracts were concentrated before IR measurement, so that a detection limit of 0.1 mg/L (100 ug/L) could be obtained.

2. Herbicides

The detection limits for the herbicides are as follows:

2,4-D 0.06 ug/L
2,4,5-TP 0.02 ug/L

The results from the first round sampling have been erroneously reported with different detection limits. The correction should be applied to the following samples:

<u>Sampling Date</u>	<u>Sample ID</u>
1/23/85	TW12, TW13, TW15, TW17, TW20
1/24/85	MW420, MW450
1/29/85	MW350, MW360, MW370, MW380, MW470
1/30/85	MW250, MW260, MW261, MW270, MW280, MW460, MW461, FB-1
1/31/85	MW230, MW240, FB-2

CASTLE AFB - Pesticides and herbicides, second column confirmation

Sample ID	MW360	MW380	MW470	SG-1
Date of Sampling	1/29/85	1/29/85	1/29/85	3/4/85
Compound	1st Column	2nd Column	1st Column	2nd Column
Endrin	ND	ND	ND	ND
Lindane	ND	ND	ND	0.02
Methoxychlor	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND
2,4-D	ND	ND	ND	ND
2,4,5-TP	0.08	0.06	0.08	0.10

Sample ID	SG-2	SG-6	SG-2	SG-3
Date of Sampling	3/4/85	3/4/85	4/8/85	4/8/85
Compound	1st Column	2nd Column	1st Column	2nd Column
Endrin	ND	ND	ND	ND
Lindane	0.05	0.08	ND	ND
Methoxychlor	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND
2,4-D	ND	2.4	0.54	0.28
2,4,5-TP	ND	0.07	ND	ND

CASTLE AFB - Second Column Confirmation
Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Sample ID Sampling Date	PW-3 1/22/85		PW-5 1/22/85		TW-18 1/23/85		MW-60 1/30/85		MW-430 1/30/85	
			First	Second	First	Second	First	Second	First	Second	First	Second
Chloromethane	1.0		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1		1.4	0.8	ND	0.5	1.6	1.0	ND	1.7	ND	ND
Chloroform	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02		ND	ND	0.86	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1		ND	ND	ND	ND	ND	ND	8.0	5.5	10	8.3
Carbon tetrachloride	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1		25	16	7.3	ND	120	85	ND	ND	ND	ND
Dibromochloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3		ND	ND	DN	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2		ND	ND	3.0	1.3	ND	ND	ND	ND	ND	ND

CASTLE AFB - Second Column Confirmation
Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Sample ID Sampling Date	MW210 1/31/85		FB-1 1/30/85		MW330 1/31/85		MW300 2/1/85		MW310 2/1/85	
			First	Second	First	Second	First	Second	First	Second	First	Second
Chloromethane	1.0		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethene	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1		4.9	ND	17	24	7.2	4.2	1.4	ND	1.9	1.3
Carbon tetrachloride	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1		67	40	ND	ND	0.44	ND	4.2	5.5	22	19
Dibromochloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05		6.8	8.0	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

CASTLE AFB - Second Column Confirmation
Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/FID)

Component	Detection Limit ug/L	Sample ID Sampling Date	SG-2 3/4/85		SG-5 3/4/85		M4440 4/2/85		M4450 4/2/85		M4230 4/3/85	
			First	Second	First	Second	First	Second	First	Second	First	Second
Chloromethane	1.0		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1		2.6	ND	2.2	ND	0.67	ND	0.67	ND	ND	ND
Carbon tetrachloride	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1		ND	ND	ND	ND	8.3	5.6	ND	ND	3.4	4.5
Dibromochloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethane	0.05		ND	ND	ND	ND	ND	ND	0.70	ND	ND	ND
Chlorobenzene	0.3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

CASTLE AFB - Second Column Confirmation
Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PCD)

Component	Detection Limit ug/L	Sample ID Sampling Date	MW410 4/5/85		New PW 4/9/85		PW-3 4/9/85		PW-5A 4/9/85		PW-8A 4/9/85	
			First	Second	First	Second	First	Second	First	Second	First	Second
Chloromethane	1.0		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2		2.2	0.3	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5		1.2	0.7	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02		0.82		26	20	0.26		40	37	40	36
1,1,1-Trichloroethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3		0.63		ND	ND	44		ND	ND	ND	ND
Trichloroethene	0.1		0.54	0.2	ND	ND	50		ND	ND	ND	ND
Dibromochloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3		2.0	2.0	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

CASTLE AFB - Second Column Confirmation
Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Sample ID Sampling Date	TW-14 4/10/85		TW-15 4/10/85		TW-17 4/10/85		TW-18 4/10/85	
			First	Second	First	Second	First	Second	First	Second
Chloromethane	1.0		ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2		ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.8		ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2		ND	ND	ND	ND	0.22	ND	ND	ND
Chloroethane	0.5		ND	ND	ND	ND	3.4	1.0	ND	ND
Methylene chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane			ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2		ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1		1.7	1.0	ND	ND	ND	ND	4.0	2.1
Trans-1,2-dichloroethane	0.1		2.8	1.5	0.38	ND	0.98	ND	1.3	ND
Chloroform	0.1		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02		ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1		ND	ND	18	ND	20	ND	21	ND
Carbon tetrachloride	0.1		ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1		ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3		ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1		280	190	39	50	110	110	150	200
Dibromochloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2		ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2		ND	ND	ND	ND	ND	ND	ND	ND
Bromoforn	0.2		ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05		0.73	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3		ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2		0.79	1.2	ND	ND	ND	ND	ND	ND
Benzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.2		ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND

CASTLE AFB - Second Column Confirmation
Volatiles analysis by EPA Methods 601 (GC/Hall Detector) and 602 (GC/PID)

Component	Detection Limit ug/L	Sample ID Sampling Date	M#430 4/10/85		M#300 4/11/85		M#201 4/11/85		M#310 4/11/85	
			First	Second	First	Second	First	Second	First	Second
Chloromethane	1.0		ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	1.2		ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	1.0		ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	0.5		ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.2		ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane			ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.2		ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.1		ND	ND	2.2	ND	ND	ND	ND	ND
Trans-1,2-dichloroethane	0.1		ND	ND	3.7	ND	ND	ND	2.0	1.3
Chloroform	0.1		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02		ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.1		22	10	ND	ND	22	ND	ND	ND
Carbon tetrachloride	0.1		ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.1		ND	ND	ND	ND	ND	ND	ND	ND
Trans-1,3-dichloropropene	0.3		ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.1		ND	ND	59	32	43	35	70	48
Dibromochloromethane	0.1		ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND
Cis-1,3-dichloropropene	0.2		ND	ND	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	0.2		ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	0.2		ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.05		ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.05		ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	0.3		ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	0.3		ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.2		ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.2		ND	-	ND	-	ND	-	ND	-
Toluene	0.2		ND	-	ND	-	ND	-	ND	-
Ethylbenzene	0.2		ND	-	ND	-	ND	-	ND	-

CASTLE AFB

Metals analysis

Duplicates - Mercury

<u>Sampling Period</u>	<u>Sample No.</u>	<u>Mercury, ug/L</u>
Jan. 1985	MW230	ND
	MW250	ND
	MW380	ND
	MW460	ND
Mar. 1985	SG-1	ND
Apr. 1985	MW280	ND
	MW420	ND
	PW-4	ND

Duplicates - Lead

<u>Sampling Period</u>	<u>Sample No.</u>	<u>Lead, ug/L</u>
Mar. 1985	SG-6A	ND
	SG-1	ND
Apr. 1985	MW350	ND
	PW-4	ND

Duplicates - Cadmium, chromium, silver

<u>Sampling Period</u>	<u>Sample No.</u>	<u>Cadmium, ug/L</u>	<u>Chromium, ug/L</u>	<u>Silver, ug</u>
Mar. 1985	SG-6A	ND	ND	ND

Matrix Spike - Mercury

<u>Sampling Period</u>	<u>Sample No.</u>	<u>Amount Added, ug/L</u>	<u>Recovered, ug/L</u>	<u>%</u>
Apr. 1985	SG-1	10	10	100
	MW470	10	8	80

Matrix spike - Sample TW-17, April Sampling Period

<u>Element</u>	<u>Amount Added, mg/L</u>	<u>Recovered, mg/L</u>	<u>%</u>
Cadmium	1.0	1.0	100
Chromium	0.50	0.54	108
Lead	0.005	0.004	80
Silver	0.20	0.19	95

CASTLE AFB

Metals analysis

Method Spike

Sampling Period	Element	Amount added mg/L	Recovered mg/L	%
January 1985	Cadmium	0.20	0.20	100
	Chromium	0.50	0.54	108
	Lead	1.0	0.95	95
	Mercury	0.010	0.009	90
	Silver	0.40	0.39	98
March 1985	Cadmium	0.20	0.21	105
	Chromium	0.50	0.46	92
	Lead	1.0	1.0	100
	Mercury	0.010	0.011	110
	Silver	0.40	0.39	98
April 1985	Cadmium	0.20	0.21	105
	Chromium	1.0	0.96	96
	Lead	0.005	0.0035	70
	Mercury	0.010	0.011	110
	Silver	0.40	0.39	98

Herbicide Analysis

Method Spike

Sampling Period	Compound	Amount added ug/L	Recovered ug/L	%
January 1985	2,4-D	0.20	0.21	105
	2,4,5-TP	0.35	0.41	117
March 1985	2,4-D	7.9	11.2	142
	2,4,5-TP	2.1	2.3	110
April 1985	2,4-D	0.79	1.1	139
	2,4,5-TP	0.21	0.20	95
April 1985	2,4-D	0.79	0.66	84
	2,4,5-TP	0.21	0.14	67

Pesticide Analysis

Method Spike

Sampling Period	Compound	Amount Added ug/L	Recovered ug/L	%
April 1985	Endrin	0.20	0.15	76
	Lindane	0.10	0.07	70
	Methoxychloe	2.0	1.4	70



inter-office memorandum

TO: Katherine Sheedy
cc: Alison Dunn
Lisa Hamilton

DATE: October 31, 1985

FROM: David Ben-Hur *DA*

SUBJECT: Total Recoverable Phenolics, EPA Method 420.1

W. O. No.: 0628-09-02
0628-09-04

The subject method is in reality two methods rolled into one. In the first case, the phenolic compounds are distilled, color is developed with 4-amino-antipyrine, and the absorbance is measured directly. The stated method detection limit is 0.05 mg/L (50 ug/L), but, as is the case with many analytical methods, this detection limit is a statistical derivation and bears little resemblance to a realistic detection limit that is obtainable in the laboratory. EAL, the laboratory that performs the phenolics analyses for us, states their detection limit to be 0.1 mg/L (100 ug/L).

The second method consists of the procedure of the first method followed by a chloroform extraction of the color. The stated detection limit of the second method is 0.005 mg/L (5 ug/L), and again realistically, the achievable detection limit is probably twice the stated value.

Without modification, neither method can reach the requested detection limit of 1 ug/L.

In the analyses of the samples for Castle AFB and for Travis AFB and Pt. Arena, the first method, consisting of direct color development and measurement, was performed, resulting in a detection limit of 0.1 mg/L



inter-office memorandum

TO: Katherine Sheedy
cc: Alison Dunn, Concord Office

DATE: November 4, 1985

FROM: David Ben-Hur)B .

SUBJECT: Castle AFB, Volatiles Analysis

W. O. No.: 0628-09-02

In the reports issued on the analyses for volatiles on water samples collected at Castle AFB, the detection limit for trans-1,3-dichloropropene should be 0.2 ug/L and that for cis-1,3-dichloropropene should be 0.3 ug/L.

APPENDIX M

FEDERAL AND STATE DRINKING WATER AND
HUMAN HEALTH STANDARDS APPLICABLE IN
STATE OF CALIFORNIA



GUIDE TO GROUND-WATER STANDARDS **OF THE UNITED STATES**

API PUBLICATION 4366

JULY 1983

Prepared by
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15 Loveton Circle
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3. FEDERAL PROTECTION OF GROUND-WATER QUALITY

The federal programs dealing with the protection of ground-water quality are administered largely by the Environmental Protection Agency (EPA). The federal programs which provide the framework for state regulations are summarized in this section.



3.1 GROUND-WATER PROTECTION POLICY

At this writing, February 1983, U.S. EPA's final policy on ground-water protection, scheduled for September 1982 release, has not been published. Based on the proposed strategy published by EPA in November 1980 and recent press releases, it appears that EPA will be implementing a policy that would give the states lead responsibility in the protection of ground-water quality. EPA's efforts apparently will be focused in three major areas:

1. Development of an internally consistent federal approach to ground-water protection
2. Monitoring, research and development efforts directed toward more comprehensive problem definition and new detection, controls, and clean-up technology development
3. Guidance, coordination, and assistance to states in the development of state policies

A significant component of EPA's policy is expected to be a ground-water classification system which could be used to determine the degree of protection needed for various types of ground water. Ground-water classification is discussed in Chapter 4.

3.2 CLEAN WATER ACT

This statute refers to ground-water protection in municipal waste water treatment, planning, and research programs. Its principal regulatory programs, however, focus on surface water. Section 303 empowers EPA to approve states' water quality standards which are based on the states' classification of rivers and streams. Many states have included ground water in their definition of "waters of the state" for purposes of this act (state summaries). On this basis the National (state) Pollutant Discharge Elimination System (NPDES/SPDES) permitting process may be invocable for purposes of ground-water protection. In addition the act empowers EPA to

1. Develop a comprehensive program for ground-water pollution control [Section 102(a)]
2. In cooperation with states, equip and maintain a surveillance system for monitoring ground-water quality [Section 104(a)(5)]
3. Provide grants to states and area-wide agencies to develop ground-water quality management plans to identify salt water intrusion and control disposal of pollutants in subsurface excavations, and control disposition of wastes. (May include authority for comprehensive ground-water management plans, including conjunctive use with surface water) [Section 102(c), 208(b)]
4. Require development of Best Management Practices (BMP) to control nonpoint source pollution problems to ground-water quality [Section 208(b)]
5. Develop criteria for ground-water quality considering kind and extent of effects on health and welfare from the presence of pollutants [Section 304(a)]
6. Determine information necessary to restore and maintain chemical, physical, and biological integrity of ground water [Section 304(a)]
7. Issue information on the factors necessary to restore and maintain chemical, physical, and biological integrity of ground water [Sections 304(a)(2)]

3.3 SAFE DRINKING WATER ACT

This statute authorizes EPA to set maximum contaminant levels (MCLs) and monitoring requirements for public water systems and provides for the protection of underground sources of drinking water. The MCLs regulate the quality of "finished" water, i.e., water as delivered, not the quality of the source water. As discussed below, the MCLs have been utilized by EPA and the states as the basis for other regulations dealing with ground-water quality and protection.



3.3.1 National Interim Primary Drinking Water Regulations

EPA initiated a detailed study of the health effects of various contaminants in water soon after the Safe Drinking Act (SDWA) was signed into law. So that the regulations could include the findings of this and other studies, the primary drinking water regulations were to be developed in two stages: an interim version and a final version. The interim version of the regulation became effective 24 June 1977. SDWA provides for delegation of authority to the states. State Primary Drinking Water Regulations must be at least as stringent as the federal regulations.

The National Interim Primary Drinking Water Regulations define Maximum Contaminant Level as the maximum permissible level of a contaminant in water which is delivered to the free-flowing outlet of the ultimate user of a public water system, except in the case of turbidity (applicable to surface water only) where the maximum permissible level is measured at the point of entry to the distribution system. The MCLs are provided with the state summaries.

3.3.2 National Secondary Drinking Water Regulations

These regulations control contaminants in drinking water that primarily affect the aesthetic qualities relating to the public acceptance of drinking water. At considerably higher concentrations of these contaminants, health implications may also exist as well as aesthetic degradation. The National Secondary Drinking Water Regulations are not federally enforceable but are intended as guidelines for the states.

Secondary Maximum Contaminant Levels (SMCLs) are defined as the maximum permissible level of a contaminant in water which is delivered to the free-flowing outlet of the ultimate user of a public water system. Federal and state SMCLs are provided in the state summaries. The states may establish higher or lower levels which may be appropriate depending upon local conditions such as unavailability of alternate sources of water or other compelling factors, provided the public health and welfare are not adversely affected.

3.3.3 Sole Source Aquifer

The Sole Source Aquifer provisions of SDWA allow EPA to designate an aquifer as the sole source of drinking water for an area thereby guaranteeing protection from contamination by federally assisted activities. Local, regional, or state agencies can petition EPA for sole source designation. The EPA Administrator may designate an aquifer which is a sole or principal drinking water source if its contamination would create a significant hazard to public health. If the designation is made, no federal money or financial commitment may be made for any project which the Administrator determines may contaminate the designated aquifer through its recharge zone.

At this writing, February 1983, EPA has designated the following ten sole source aquifers:

Biscayne Aquifer - Florida	Nassau and Suffolk counties - New York
Buried Valley Aquifer - New Jersey	Cape Cod - Massachusetts
Edwards Aquifer - Texas	Fresno - California
Camano Island—Whidbey Island Aquifer - Washington	Ten Mile Creek - Maryland
Spokane-Rathdrum Aquifer - Washington and Idaho	Northern Guam Lens - Guam

The following eighteen are under consideration:

Arizona	New York
Santa Cruz, Upper Santa Cruz, Aura-Altar Basins	Kings and Queens counties
California	Sardinia
Scotts Valley	Schenectady
	Vestal
Delaware	Pennsylvania
New Castle County	Seven Valleys
Florida	Texas
Volusia - Floridan Aquifer	Carrizo-Wilcox Aquifer
Idaho	Texas and New Mexico
Snake River Plain	Delaware Basin
Louisiana	Wisconsin
Baton Rouge	Niagara Aquifer
DeSota Parish	
New Jersey	
Coastal Plain	
Ridgewood	
Upper Rockaway	

3.3.4 Underground Injection Control

The Underground Injection Control (UIC) program regulates the uses of underground injection wells to protect an underground source of drinking water (USDW). USDW means an aquifer or its portion which

1. supplies any public water system or contains a sufficient quantity of ground water to supply a public water system;
2. currently supplies drinking water for human consumption or contains less than 10,000 mg/liter total dissolved solids; and
3. is not an exempted aquifer (40 CFR 146.04 provides criteria for exemption).

SDWA requires any state designated by EPA as requiring a UIC program to develop and submit a state UIC program for EPA approval. EPA has designated each of the fifty states.

The federal program classifies injection wells as follows:

Class I—Wells used to inject hazardous waste, or other industrial and municipal disposal wells which inject fluids beneath the lower-most formation containing a USDW within one-quarter mile of the well bore.

Class II—Wells that inject fluids

1. which are brought to the surface as part of conventional oil or natural gas production and may be mixed with production waste waters from gas plants, unless those waters are classified as a hazardous waste at the time of injection;
2. for enhanced recovery of oil or natural gas; and
3. for storage of hydrocarbons which are liquid at standard temperature and pressure.

Class III—Wells that inject for extraction of minerals including

1. mining of sulfur by the Frasch process;
2. in situ production of uranium or other metals. This category includes only in situ production from ore bodies which have not been conventionally mined. Solution mining of conventional mines such as stopes leaching is included in Class V; and
3. solution mining of salts or potash.

Class IV—Wells used to dispose of hazardous or radioactive waste into or above a formation which contains a USDW within one-quarter mile of the well. Also, wells used to inject hazardous waste that cannot be classified as Class I or Class IV under the above criteria are Class IV wells.

Class V—All other injection wells (40 CFR 146.05(e) and 146.51 provide specific information and exemptions).

Underground injection is controlled through the permitting process. Construction, operation, monitoring and reporting activities are controlled. Individual state programs are based upon, and must be essentially equivalent to, the federal criteria and standards (40 CFR 146).

3.4 TOXIC SUBSTANCE CONTROL ACT

This statute (TSCA) authorizes EPA to restrict or prohibit the manufacture, distribution, and use of products which may result in unreasonable risk to health and the environment. Although ground water is not specifically named in the Act, EPA has taken the position that the protection of health and the environment includes the protection of ground water.

3.5 FEDERAL INSECTICIDE, FUNGICIDE, RODENTICIDE ACT

This statute (FIFRA) gives EPA the responsibility to control the sale and use of all pesticides to prevent unreasonable adverse environmental and health effects. The use and disposal of pesticide packages and containers is also regulated. In deciding whether to register, cancel, suspend, or change the classification of a pesticide, EPA considers a broad range of environmental impacts including those affecting ground water.





3.6 RESOURCE CONSERVATION AND RECOVERY ACT

The Solid Waste Disposal Act and the Resource Recovery Act of 1970, as amended by the Resource Conservation and Recovery Act of 1976 (RCRA), require EPA to establish a national program to regulate the management of waste materials.

3.6.1 Solid Waste

Subtitle D of RCRA established a broad-based national program to improve solid waste management through the development of state and regional solid waste management plans. The act offered federal financial assistance to states interested in developing and implementing a solid waste management plan. The state plans, under federal guidelines, identify respective responsibilities of local, state, and regional authorities, and encourage resource recovery and conservations and the application and enforcement of environmentally sound disposal practices.

A major element of the Subtitle D program is the open dump inventory. Section 4005 of RCRA prohibits open dumping. Federal criteria for classifying solid waste management facilities are provided in 40 CFR 257. EPA cannot approve a state solid waste management program with less stringent criteria. Solid waste management facilities failing to satisfy the criteria are considered open dumps. In order to satisfy these criteria, a facility or practice (in addition to other environmental considerations) shall not contaminate an underground drinking water source beyond the solid waste boundary or beyond an alternative boundary established by the state or in court pursuant to the stipulations of 40 CFR 257.3-4. The federal criteria define contamination as an exceedence of the MCLs provided in the National Interim Primary Drinking Water Regulations or an increase in concentration of any parameter for which the ambient concentration exceed the MCL.

3.6.2 Hazardous Waste

EPA has issued a series of hazardous waste regulations under Subtitle C of RCRA (40 CFR 260 to 267 and 122 to 124). On 19 May 1980, EPA issued a comprehensive set of standards for generators and transporters of hazardous waste and "interim status" standards for facilities in existence on 19 November 1980, that treat, store, or dispose of hazardous waste. Such facilities were allowed to operate under interim status until they received an RCRA permit. Subsequently, EPA issued standards for granting RCRA permits to treatment and storage facilities. Standards for land disposal facilities were issued on 26 July 1982—virtually completing the program for controlling hazardous waste under RCRA.

The standards for permitting land disposal facilities were issued after a wide range of regulatory options were considered. Over a period of several years, EPA proposed two different sets of land disposal standards and solicited comments on various issues. On 13 February 1981, EPA issued temporary standards for new land disposal facilities. The 26 July regulations replace those temporary standards except for Class I underground injection wells. These will remain subject to the temporary standards until final standards are issued.

The regulations consist primarily of two complementary sets of performance standards:

1. A set of design and operating standards tailored to each of four types of facilities
2. Ground-water monitoring and response regulations applicable to all land disposal facilities

The design and operating standards implement a liquids management strategy that has two goals:

1. Minimize leachate generated at the facility
2. Remove leachate generated to minimize its chance of reaching ground water

The major requirements include

1. Liner
 - Requirement: design to prevent migration of waste out of the facility during its active life
 - Applicability: landfills, surface impoundments, and waste piles
2. Leachate collection and removal
 - Requirement: collect and remove leachate from the facility and ensure that leachate depth over the liner does not exceed 30 centimeters (1 foot)
 - Applicability: landfills and waste piles



3. Run-on and runoff control systems
 - Requirement: design to control flow during at least 25-year storm
 - Applicability: landfills, waste piles, land treatment
4. Wind dispersal controls
 - Requirement: cover waste or otherwise manage unit to control wind dispersal
 - Applicability: landfills, waste piles, and land treatment units that contain particulate matter
5. Overtopping controls
 - Requirement: prevent overtopping or overfilling
 - Applicability: surface impoundments
6. Disposal unit closure
 - Requirement: final cover (cap) over waste unit designed to minimize infiltration of precipitation
 - Applicability: landfills and surface impoundments (if used for disposal)
7. Storage unit closure
 - Requirement: remove waste and decontaminate
 - Applicability: surface impoundments used for treatment or storage and waste piles
8. Postclosure Care
 - Maintain effectiveness of final cover
 - Operate leachate collection and removal system
 - Maintain ground-water monitoring system (and leak detection system where double liner is used)
 - Continue 30 years after closure

The goal of the ground-water monitoring and response program is to detect and correct any ground-water contamination. There are four main elements:

1. A detection monitoring program which requires the permittee to install a system to monitor ground water in the uppermost aquifer to determine if a leachate plume has reached the edge of the waste management area.
2. A ground-water protection standard is set when a hazardous constituent is detected. The standard specifies concentration limits, compliance point, and compliance period.
3. A compliance monitoring program determines if the facility is complying with its ground-water protection standard.
4. Corrective action is required when the ground-water protection standard is violated. The permittee must either remove the contamination or treat it in place to restore ground-water quality.

Until hazardous waste management facilities are issued permits, existing facilities will continue to operate under interim status standards. Facilities operating under interim status will be required to file Part B applications for final permits.

Under Subtitle C of RCRA, EPA approves state hazardous waste management programs in two phases. Phase I authorization gives states the right to control transportation and generation of hazardous wastes within their borders and to regulate existing treatment, storage, and disposal facilities. Phase II authorization includes the permitting of new facilities.

3.7 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT

This statute (CERCLA), commonly referred to as Superfund, authorizes EPA to respond to releases or threatened releases into the environment, including ground water, of any hazardous substance which may present an imminent and substantial danger to public health. The act provides funds for emergency action and has cost recovery provisions.



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Classification—Ground water is included in the definition of "Waters of the State" as found in the California Water Quality Act. Ground water has been included in beneficial use classes developed as part of Basin Management Programs of the Water Resources Control Board and the Regional Boards.

Quality Standards—The general policy is a nondegradation policy to protect the present and possible future uses of ground water as a source of potable, industrial, and agricultural water supply. Quality standards are specific to each use class and Basin Program.

Drinking Water Standards—The California Water Resources Control Board has adopted the federal primary and secondary drinking water standards.

Appropriations—There are no state-wide permit requirements, however, see Controlled Use Areas below.

Controlled Use Areas—Several ground-water basins are being managed by local authorities in response to special legislative acts and court orders. These authorities regulate ground-water withdrawals within their jurisdictions. However, these areas account for less than five percent of all ground-water basins.

Well Construction—Local counties may adopt well construction standards and require drillers to be licensed. Approximately half of California's 58 counties have done so.

Underground Injection Control—California is in the process of submitting a UIC program for EPA approval. The Water Resources Control Board will be the lead agency in the program. Class II wells will be regulated by the Oil and Gas Division of the Department of Conservation.

Waste Management Facilities—The solid and hazardous waste management programs are administered by the Solid Waste Management Board. The Hazardous Waste Management Regulations are administered by the Department of Health Services.

Solid Waste—The California Solid Waste Management Regulations require a ground-water monitoring system for disposal sites. Monitoring requirements are on a case-by-case basis.

Hazardous Waste—California has received interim status authorization for its RCRA Phase I program and is seeking Phase II authority. Ground-water monitoring requirements are included in permit conditions and are generally equivalent to EPA requirements.

Sole Source Aquifers—The Fresno area aquifer has been designated as sole source by EPA. The Scotts Valley aquifer is under consideration by EPA.

Geological Surveys—

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Department of Conservation
1416 Ninth St.
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916-445-1923
State Geologist:
Dr. James F. Davis

Water Resources Division
U.S. Geological Survey
Federal Bldg., Room W-2235
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916-484-4606
District Chief:
T.J. Durbin

References—

California Water Quality Act
(California Water Code, Div. 7, Ch. 482)

California Solid Waste Management Regulations
(California Admin. Code, Title 14, Div. 7, Ch. 1-5
and 9)

California Hazardous Waste Management
Regulations
(California Admin. Code, Title 22, Div. 4, Ch. 30)

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Revisions provided by Ms. Helen Joyce Peters in a letter received 11 April 1983.

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Parameter (mg/l unless noted)	Drinking Water Standards		Quality Standards	Monitoring Requirements	
	Federal	State		Solid Waste	Hazardous Waste
Arsenic	0.05	0.05			
Barium	1.0	1.0			
Cadmium	0.010	0.010			
Chromium	0.05	0.05			
Lead	0.05	0.05			
Mercury	0.002	0.002			
Selenium	0.01	0.01			
Silver	0.05	0.05			
Fluoride	1.4-2.4	1.4-2.4			
Nitrate (as N)	10.0	10.0			
Endrin	0.0002	0.0002			
Lindane	0.004	0.004			
Methoxychlor	0.1	0.1			
Toxaphene	0.005	0.005			
2,4-D	0.1	0.1			
2,4,5-TP Silver	0.01	0.01			
Trihalomethanes	0.1	0.1			
Turbidity (TU)	1.0	1.0			
Coliform bacteria — membrane filter test (#/100 ml)	1.0	1.0			
Gross alpha (pCi/l)	15.0	15.0			
Combined Radium 226 and Radium 228	5.0	5.0			
Beta and photon particle activity (mrem/yr)	4.0	4.0			
Sodium	M	M			
Chloride	250.0	250.0			
Color (units)	15.0	15.0			
Copper	1.0	1.0			
Corrosivity	Noncorrosive	Noncorrosive			
Foaming agents	0.5	0.5			
Iron	0.3	0.3			
Manganese	0.05	0.05			
Odor (threshold no.)	3.0	3.0			
pH (units)	6.5-8.5	6.5-8.5			
Sulfate	250.0	250.0			
Total dissolved solids	500.0	500.0			
Zinc	5.0	5.0			
Phenols					
Specific conductance					
Total organic carbon					
Total organic halogen					

Note: "M" denotes monitoring requirement. See Section 4.3.

ENVIRONMENTAL PROTECTION AGENCY NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS

(40 CFR 141; 40 FR 59565, December 24, 1975; Amended by 41 FR 28402, July 9, 1976; 44 FR 68641, November 29, 1979; Corrected by 45 FR 15542, March 11, 1980; 45 FR 57342, August 27, 1980)

Title 40—Protection of Environment CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

SUBCHAPTER D—WATER PROGRAMS PART 141—NATIONAL INTERIM PRIMARY DRINKING WATER REGULATIONS

Subpart A—General

Sec.

- 141.1 Applicability.
- 141.2 Definitions.
- 141.3 Coverage.
- 141.4 Variances and exemptions.
- 141.5 Siting requirements.
- 141.6 Effective dates.

Subpart B—Maximum Contaminant Levels

- 141.11 Maximum contaminant levels for inorganic chemicals.
- 141.12 Maximum contaminant levels for organic chemicals.
- 141.13 Maximum contaminant levels for turbidity.
- 141.14 Maximum microbiological contaminant levels.
- 141.15 Maximum contaminant levels for radium-226, radium-228, and gross alpha particle radioactivity in community water systems.
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Subpart C—Monitoring and Analytical Requirements

- 141.21 Microbiological contaminant sampling and analytical requirements.
- 141.22 Turbidity sampling and analytical requirements.
- 141.23 Inorganic chemical sampling and analytical requirements.
- 141.24 Organic chemicals other than total trihalomethanes, sampling and analytical requirements.
- 141.25 Analytical Methods for Radioactivity.
- 141.26 Monitoring Frequency for Radioactivity in Community Water Systems.
- 141.27 Alternative analytical techniques.
- 141.28 Approved laboratories.
- 141.29 Monitoring of consecutive public water systems.

Subpart D—Reporting Public Notification, and Record-keeping

- 141.31 Reporting requirements.
- 141.32 Public notification of variances, exemptions, and non-compliance with regulations.
- 141.33 Record maintenance.

Subpart E—Special Monitoring Regulations for Organic Chemicals

141.40 Special monitoring for organic chemicals.

Authority: Secs. 1412, 1414, 1445, and 1450 of the Public Health Service Act, 88 Stat. 1660 (42 U.S.C. 300g-1, 300g-3, 300j-4, and 300j-9).

Subpart A—General

§ 141.1 Applicability.

This part establishes primary drinking water regulations pursuant to section 1412 of the Public Health Service Act, as amended by the Safe Drinking Water Act (Pub. L. 93-523); and related regulations applicable to public water systems.

§ 141.2 Definitions.

As used in this part, the term:

(a) "Act" means the Public Health Service Act, as amended by the Safe Drinking Water Act, Pub. L. 93-523.

(b) "Contaminant" means any physical, chemical, biological, or radiological substance or matter in water.

(c) "Maximum contaminant level" means the maximum permissible level of a contaminant in water which is delivered to the free flowing outlet of the ultimate user of a public water system, except in the case of turbidity where the maximum permissible level is measured at the point of entry to the distribution system. Contaminants added to the water under circumstances controlled by the user, except those resulting from corrosion of piping and plumbing caused by water quality, are excluded from this definition.

(d) "Person" means an individual, corporation, company, association, partnership, State, municipality, or Federal agency.

(e) "Public water system" means a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year. Such term includes (1) any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system, and (2) any collection or pretreatment storage facilities not under such control which are used primarily in connection with such system. A public water system is either

a "community water system" or a "non-community water system."

(i) "Community water system" means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

(h) "Non-community water system" means a public water system that is not a community water system.

(f) "Sanitary survey" means an on-site review of the water source, facilities, equipment, operation and maintenance of a public water system for purpose of evaluating the adequacy of such source, facilities, equipment, operation and maintenance for production and distribution of safe drinking water.

(g) "Standard sample" means an aliquot of finished drinking water that is examined for the presence of coliform bacteria.

(h) "State" means the agency of State government which has jurisdiction over public water systems. During any period when a State does not have primary enforcement responsibility pursuant to Section 1413 of the Act, the term "State" means the Regional Administrator, U.S. Environmental Protection Agency.

(i) "Supplier of water" means a person who owns or operates a public water system.

(j) "Dose equivalent" means the product of the absorbed dose from ionizing radiation and such factors as account for differences in biological effectiveness to the type of radiation and its distribution in the body as specified by the International Commission on Radiological Units and Measurements (ICRU).

(k) "Rem" means the unit of dose equivalent from ionizing radiation to total body or any internal organ or system. A "millirem (mrem)" is 1/1000 of a rem.

(l) "Picrocurie (pCi)" means that quantity of radioactive material producing 2.22 nuclear transformations per minute.

(m) "Gross alpha particle activity" means the total radioactivity due to alpha particle emission as inferred from measurements on a dry sample.

(n) "Man-made beta particle and photon emitters" means all radionuclides emitting beta particles and/or photons.

[Sec. 141.2(n)]

listed in Maximum Permissible Body Burdens and Maximum Permissible Concentration of Radionuclides in Air or Water for Occupational Exposure. NIOS Handbook 69, except the daughter products of thorium-232, uranium-235 and uranium-238.

(e) "Gross beta particle activity" means the total radioactivity due to beta particle emission as inferred from measurements on a dry sample.

[41 FR 28402, July 9, 1976]
[141.2 (p)-(t) added by 44 FR 68641, November 29, 1979]

(p) "Halogen" means one of the chemical elements chlorine, bromine or iodine.

(q) "Trihalomethane" (THM) means one of the family of organic compounds, named as derivatives of methane, wherein three of the four hydrogen atoms in methane are each substituted by a halogen atom in the molecular structure.

(r) "Total trihalomethanes" (TTHM) means the sum of the concentration in milligrams per liter of the trihalomethane compounds (trichloromethane [chloroform], dibromochloromethane, bromodichloromethane and tribromomethane [bromoform]), rounded to two significant figures.

(s) "Maximum Total Trihalomethane Potential (MTP)" means the maximum concentration of total trihalomethanes produced in a given water containing a disinfectant residual after 7 days at a temperature of 25° C or above.

(t) "Disinfectant" means any oxidant, including but not limited to chlorine, chlorine dioxide, chloramines, and ozone added to water in any part of the treatment or distribution process, that is intended to kill or inactivate pathogenic microorganisms.

§ 141.3 Coverage.

This part shall apply to each public water system, unless the public water system meets all of the following conditions:

(a) Consists only of distribution and storage facilities (and does not have any collection and treatment facilities);

(b) Obtains all of its water from, but is not owned or operated by, a public water system to which such regulations apply;

(c) Does not sell water to any person; and

(d) Is not a carrier which conveys passengers in interstate commerce.

§ 141.4 Variances and exemptions.

Variances or exemptions from certain provisions of these regulations may be granted pursuant to Sections 1415 and 1416 of the Act by the entity with primary enforcement responsibility. Provisions under Part 142, *National Interim Primary Drinking Water Regulations Implementation*—subpart E (Variances)

and subpart F (Exemptions)—apply where EPA has primary enforcement responsibility.

§ 141.5 Siting requirements.

Before a person may enter into a financial commitment for or initiate construction of a new public water system or increase the capacity of an existing public water system, he shall notify the State, and, to the extent practicable, avoid locating part or all of the new or expanded facility at a site which:

(a) Is subject to a significant risk from earthquakes, floods, fires or other disasters which could cause a breakdown of the public water system or a portion thereof; or

(b) Except for intake structures, is within the floodplain of a 100-year flood or is lower than any recorded high tide where appropriate records exist.

The U.S. Environmental Protection Agency will not seek to override land use decisions affecting public water systems siting which are made at the State or local government levels.

§ 141.6 Effective dates.

[141.6 revised by 44 FR 68641, November 29, 1979]

(a) Except as provided in paragraph (b) of this section, the regulations set forth in this part shall take effect on June 24, 1977.

(b) The regulations for total trihalomethanes set forth in § 141.12(c) shall take effect 2 years after the date of promulgation of these regulations for community water systems serving 75,000 or more individuals, and 4 years after the date of promulgation for communities serving 10,000 to 74,999 individuals.

(c) The regulations set forth in 141.11 (a), (c) and (d); 141.14(a)(1); 141.14(b)(1)(c); 141.14(b)(2)(f); 141.14(d); 141.21 (a), (c) and (i); 141.22 (a) and (e); 141.23 (a)(3) and (a)(4); 141.23(f); 141.24(a)(3); 141.24 (e) and (f); 141.25(e); 141.27(a); 141.28 (a) and (b); 141.31 (a), (c), (d) and (e); 141.32(b)(3); and 141.32(d) shall take effect immediately upon promulgation.

(d) The regulations set forth in 141.41 shall take effect 18 months from the date of promulgation. Suppliers must complete the first round of sampling and reporting within 12 months following the effective date.

(e) The regulations set forth in 141.42 shall take effect 18 months from the date of promulgation. All requirements in 141.42 must be completed within 12 months following the effective date.

[141.6 (c)-(e) added by 45 FR 57342, August 27, 1980]

Subpart B—Maximum Contaminant Levels § 141.11 Maximum contaminant levels for inorganic chemicals.

(a) The MCL for nitrate is applicable to both community water systems and non-community water systems except as provided by in paragraph (d). The levels for the other organic chemicals apply only to community water systems. Compliance with MCLs for inorganic chemicals is calculated pursuant to § 141.23.

[141.11(a) amended by 45 FR 57342, August 27, 1980]

(b) The following are the maximum contaminant levels for inorganic chemicals other than fluoride:

Contaminant	Level, milligrams per liter
Arsenic	0.05
Barium	1
Cadmium	0.010
Chromium	0.05
Lead	0.05
Mercury	0.002
Nitrate (as N)	10
Selenium	0.01
Silver	0.05

(c) When the annual average of the maximum daily air temperatures for the location in which the community water system is situated is the following, the maximum contaminant levels for fluoride are:

Temperature Degrees Fahrenheit	Temperature Degrees Celsius	Level, milligrams per liter
33.7 and below	3.0 and below	2.4
33.8 to 34.3	3.1 to 3.5	2.2
34.4 to 35.0	3.6 to 3.9	2.0
35.1 to 35.6	4.0 to 4.3	1.8
35.7 to 36.2	4.4 to 4.6	1.6
36.3 to 36.8	4.7 to 4.9	1.4

(c) Fluoride at optimum levels in drinking water has been shown to have beneficial effects in reducing the occurrence of tooth decay.

[141.11 (c) amended by 45 FR 57342, August 27, 1980]

(d) At the discretion of the State, nitrate levels not to exceed 20 mg/l may be allowed in a non-community water system if the supplier of water demonstrates to the satisfaction of the State that:

(1) Such water will not be available to children under 6 months of age; and

(2) There will be continuous posting of the fact that nitrate levels exceed 10 mg/l and the potential health effects of exposure; and

(3) Local and State public health authorities will be notified annually of nitrate levels that exceed 10 mg/l; and

(4) No adverse health effects shall result.

[141.11 (d) added by 45 FR 57342, August 27, 1980]

§ 141.12 Maximum contaminant levels for organic chemicals.

[141.12 revised by 44 FR 68641, November 29, 1979]

The following are the maximum contaminant levels for organic chemicals. The maximum contaminant levels for organic chemicals in paragraphs (a) and (b) of this section apply to all community water systems. Compliance with the maximum contaminant levels in paragraphs (a) and (b) is calculated pursuant to § 141.24. The maximum contaminant level for total trihalomethanes in paragraph (c) of this section applies only to community water systems which serve a population of 10,000 or more individuals and which add a disinfectant (oxidant) to the water in any part of the drinking water treatment process. Compliance with the maximum contaminant level for total trihalomethanes is calculated pursuant to § 141.30.

Level,
milligrams
per liter

(a) Chlorinated hydrocarbons:

Endrin (1,2,3,4,10, 10-hexachloro-6,7-epoxy-1,4, 4a,5,6,7,8,8a-octa-hydro-1,4-endo, endo-5,8-dimeth-ano naphthalene).

0.0002

0.2 ppb

Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer).

0.001

1 ppb

Methoxychlor (1,1,1-Trichloro-2, 2-bis [p-methoxyphenyl] ethane).

0.1

100 ppb

Toxaphene (C₁₂H₈Cl₁₁, Technical chlorinated camphene, 67-69 per cent chlorine).

0.005

5 ppb

(b) Chlorophenoxy:

2,4-D (2,4-Dichlorophenoxyacetic acid).

0.1

100 ppb

2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid).

0.01

10 ppb

(c) Total trihalomethanes (the sum of the concentrations of bromodichloromethane, dibromochloromethane, tri-bromomethane (bromoform) and tri-chloromethane (chloroform) 0.10 mg/l.

[141.12(c) added by 44 FR 68641, November 29, 1979]

§ 141.13 Maximum contaminant levels for turbidity.

The maximum contaminant levels for turbidity are applicable to both community water systems and non-community water systems using surface water sources in whole or in part. The maximum contaminant levels for turbidity in drinking water, measured at a representative entry point(s) to the distribution system, are:

(a) One turbidity unit (TU), as de-

termined by a monthly average pursuant to § 141.27, except that five or fewer turbidity units may be allowed if the supplier of water can demonstrate to the State that the higher turbidity does not do any of the following:

- (1) Interfere with disinfection;
 - (2) Prevent maintenance of an effective disinfectant agent throughout the distribution system; or
 - (3) Interfere with microbiological determinations.
- (b) Five turbidity units based on an average for two consecutive days pursuant to § 141.22.

§ 141.14 Maximum microbiological contaminant levels.

The maximum contaminant levels for coliform bacteria, applicable to community water systems and non-community water systems, are as follows:

(a) When the membrane filter technique pursuant to § 141.21(a) is used, the number of coliform bacteria shall not exceed any of the following:

[141.14(a)(1) revised by 45 FR 57342, August 27, 1980]

(1) One per 100 milliliters as the arithmetic mean of all samples examined per compliance period pursuant to § 141.21(b) or (c), except that, at the primacy Agency's discretion systems required to take 10 or fewer samples per month may be authorized to exclude one positive routine sample per month from the monthly calculation if: (i) as approved on a case-by-case basis the State determines and indicates in writing to the public water system that no unreasonable risk to health existed under the conditions of this modification. This determination should be based upon a number of factors not limited to the following: (A) the system provided and had maintained an active disinfectant residual in the distribution system, (B) the potential for contamination as indicated by a sanitary survey, and (C) the history of the water quality at the public water system (e.g. MCL or monitoring violations); (ii) the supplier initiates a check sample on each of two consecutive days from the same sampling point within 24 hours after notification that the routine sample is positive, and each of these check samples is negative; and (iii) the original positive routine sample is reported and recorded by the supplier pursuant to § 141.31(a) and § 141.33(a). The supplier shall report to the State its compliance with the conditions specified in this paragraph and a summary of the corrective action taken to resolve the prior positive sample result. If a positive routine sample is not used for the monthly calculation, another routine

sample must be analyzed for compliance purposes. This provision may be used only once during two consecutive compliance periods.

(2) Four per 100 milliliters in more than one sample when less than 20 are examined per month; or

(3) Four per 100 milliliters in more than five percent of the samples when 20 or more are examined per month.

(b) (1) When the fermentation tube method and 10 milliliter standard portions pursuant to § 141.21(a) are used, coliform bacteria shall not be present in any of the following:

[141.14(b)(1)(i) revised by 45 FR 57342, August 27, 1980]

(i) More than 10 percent of the portions (tubes) in any one month pursuant to § 141.21(b) or (c) except that, at the State's discretion, systems required to take 10 or fewer samples per month may be authorized to exclude one positive routine sample resulting in one or more positive tubes per month from the monthly calculation if: (A) as approved on a case-by-case basis the State determines and indicates in writing to the public water system that no unreasonable risk to health existed under the conditions of this modification. This determination should be based upon a number of factors not limited to the following: (1) the system provided and had maintained an active disinfectant residual in the distribution system, (2) the potential for contamination as indicated by a sanitary survey, and (3) the history of the water quality at the public water system (e.g. MCL or monitoring violations); (B) the supplier initiates a check sample on each of two consecutive days from the sampling point within 24 hours after notification that the routine sample is positive, and each of these check samples is negative; and (C) the original positive routine sample is reported and recorded by the supplier pursuant to § 141.31(a) and § 141.33(a). The supplier shall report to the State its compliance with the conditions specified in this paragraph and report the action taken to resolve the prior positive sample result. If a positive routine sample is not used for the monthly calculation, another routine sample must be analyzed for compliance purposes. This provision may be used only once during two consecutive compliance periods.

(ii) three or more portions in more than one sample when less than 20 samples are examined per month; or

(iii) three or more portions in more than five percent of the samples when 20 or more samples are examined per month.

(2) When the fermentation tube

[Sec. 141.14(b)(2)]

Federal Register

**Friday
November 28, 1980**

Part V

Environmental Protection Agency

**Water Quality Criteria Documents;
Availability**

ENVIRONMENTAL PROTECTION
AGENCY

(FRL 1623-3)

Water Quality Criteria Documents;
AvailabilityAGENCY: Environmental Protection
Agency.ACTION: Notice of Water Quality Criteria
Documents.

SUMMARY: EPA announces the availability and provides summaries of water quality criteria documents for 64 toxic pollutants or pollutant categories. These criteria are published pursuant to section 304(a)(1) of the Clean Water Act.

AVAILABILITY OF DOCUMENTS: Summaries of both aquatic-based and health-based criteria from the documents are published below. Copies of the complete documents for individual pollutants may be obtained from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, (703-487-4650). A list of the NTIS publication order numbers for all 64 criteria documents is published below. These documents are also available for public inspection and copying during normal business hours at: Public Information Reference Unit, U.S. Environmental Protection Agency, Room 2404 (rear), 401 M St., S.W., Washington, D.C. 20460. As provided in 40 CFR Part 2, a reasonable fee may be charged for copying services. Copies of these documents are also available for review in the EPA Regional Office libraries.

Copies of the documents are not available from the EPA office in the following. Requests sent to that office will be forwarded to NTIS or returned to the sender.

1. Acenaphthene, PB81-117269.
2. Acrolein, PB81-117277.
3. Acrylonitrile, PB81-117283.
4. Aldrin/Dieldrin, PB81-117301.
5. Antimony, PB81-117319.
6. Arsenic, PB81-117327.
7. Asbestos, PB81-117335.
8. Benzene, PB81-117293.
9. Benzidine, PB81-117343.
10. Beryllium, PB81-117350.
11. Cadmium, PB81-117368.
12. Carbon Tetrachloride, PB81-117376.
13. Chlordane, PB81-117384.
14. Chlorinated benzenes, PB81-117392.
15. Chlorinated ethanes, PB81-117400.
16. Chloroalkyl ethers, PB81-117418.
17. Chlorinated naphthalene, PB81-117426.
18. Chlorinated phenols, PB81-117434.
19. Chloroform, PB81-117442.
20. 2-chlorophenol, PB81-117459.

21. Chromium, PB81-117467.
22. Copper, PB81-117473.
23. Cyanides, PB81-117483.
24. DDT, PB81-117491.
25. Dichlorobenzenes, PB81-117509.
26. Dichlorobenzidine, PB81-117517.
27. Dichloroethylenes, PB81-117525.
28. 2,4-dichlorophenol, PB81-117533.
29. Dichloropropanes/propenes, PB81-117541.
30. 2,4-dimethylphenol, PB81-117558.
31. Dinitrotoluene, PB81-117566.
32. Diphenylhydrazine, PB81-117731.
33. Endosulfan, PB81-117574.
34. Endrin, PB81-117582.
35. Ethylbenzene, PB81-117590.
36. Fluoranthene, PB81-117608.
37. Haloethers, PB81-117616.
38. Halomethanes, PB81-117624.
39. Heptachlor, PB81-117632.
40. Hexachlorobutadiene, PB81-117640.
41. Hexachlorocyclohexane, PB81-117657.
42. Hexachlorocyclopentadiene, PB81-117665.
43. Isophorone, PB81-117673.
44. Lead, PB81-117681.
45. Mercury, PB81-117699.
46. Naphthalene, PB81-117707.
47. Nickel, PB81-117715.
48. Nitrobenzene, PB81-117723.
49. Nitrophenols, PB81-117749.
50. Nitrosamines, PB81-117756.
51. Pentachlorophenol, PB81-117764.
52. Phenol, PB81-117772.
53. Phthalate esters, PB81-117780.
54. Polychlorinated biphenyls (PCBs), PB81-117798.
55. Polynuclear aromatic hydrocarbons, PB81-117806.
56. Selenium, PB81-117814.
57. Silver, PB81-117822.
58. Tetrachloroethylene, PB81-117830.
59. Thallium, PB81-117848.
60. Toluene, PB81-117853.
61. Toxaphene, PB81-117863.
62. Trichloroethylene, PB81-117871.
63. Vinyl chloride, PB81-117889.
64. Zinc, PB81-117897.

FOR FURTHER INFORMATION CONTACT: Dr. Frank Gostomski, Criteria and Standards Division (WH-585), United States Environmental Protection Agency, Washington, D.C. 20460, (202) 245-4022.

SUPPLEMENTARY INFORMATION:**Background**

Pursuant to section 304(a)(1) of the Clean Water Act, 33 U.S.C. 1314(a)(1), EPA is required to periodically review and publish criteria for water quality accurately reflecting the latest scientific knowledge:

(A) on the kind and extent of all identifiable effects on health and welfare including, but not limited to, plankton, fish,

shellfish, wildlife, plant life, shorelines, beaches, esthetics, and recreation which may be expected from the presence of pollutants in any body of water, including groundwater. (B) on the concentration and dispersal of pollutants, or their byproducts, through biological, physical, and chemical processes, and (C) on the effects of pollutants on biological community diversity, productivity, and stability, including information on the factors affecting rates of eutrophication and rates of organic and inorganic sedimentation for varying types of receiving waters.

EPA is today announcing the availability of criteria documents for 64 of the 65 pollutants designated as toxic under section 307(a)(1) of the Act. The document on TCDD (Dioxin) will be published within the next month after review of recent studies. Criteria for the section 307(a)(1) toxic pollutants being published today will replace the criteria for those same pollutants found in the EPA publication, *Quality Criteria for Water*, (the "Red Book.") Criteria for all other pollutants and water constituents found in the "Red Book" remain valid. The criteria published today have been derived using revised methodologies for determining pollutant concentrations that will, when not exceeded, reasonably protect human health and aquatic life. Draft criteria documents were made available for public comment (44 FR 15928, March 15, 1979, 44 FR 43660, July 25, 1979, 44 FR 56628, October 1, 1979). These final criteria have been derived after consideration of all comments received.

These criteria documents are also issued in satisfaction of the Settlement Agreement in *Natural Resources Defense Council, et al. v. Train*, 8 E.R.C. 2120 (1976), modified, 12 E.R.C. 1833 (D.D.C. 1979). Pursuant to paragraph 11 of that agreement, EPA is required to publish criteria documents for the 65 pollutants which Congress, in the 1977 amendments to the Act, designated as toxic under section 307(a)(1). These documents contain recommended maximum permissible pollutant concentrations consistent with the protection of aquatic organisms, human health, and some recreational activities. Although paragraph 11 imposes certain obligations on the Agency, it does not create additional authority.

The Development of Water Quality Criteria

Section 304(a)(1) criteria contain two essential types of information: (1) discussions of available scientific data on the effects of pollutants on public health and welfare, aquatic life and recreation, and (2) quantitative concentrations or qualitative assessments of the pollutants in water which will generally ensure water

quality adequate to support a specified water use. Under section 304(a)(1), these criteria are based solely on data and scientific judgments on the relationship between pollutant concentrations and environmental and human health effects. Criteria values do not reflect considerations of economic or technological feasibility.

Publication of water quality criteria of this type has been an ongoing process which EPA, and its predecessor Agency, the Federal Water Pollution Control Administration, have been engaged in since 1968. At that time the first Federal compilation of water quality criteria, the so-called "Green Book" (*Water Quality Criteria*), was published. As now, these criteria contained both narrative discussions of the environmental effects of pollutants on a range of possible uses and concentrations of pollutants necessary to support these uses. Since that time, water quality criteria have been revised and expanded with publication of the "Blue Book" (*Water Quality Criteria 1972*) in 1973 and the "Red Book" (*Quality Criteria for Water*) in 1978.

Since publication of the Red Book there have been substantial changes in EPA's approach to assessing scientific data and deriving section 304(a)(1) criteria. Previous criteria were derived from a limited data base. For many pollutants, an aquatic life criterion was derived by multiplying the lowest concentration known to have acute lethal effect on half of a test group of an aquatic species (the LC50 value) by an application factor in order to protect against chronic effects. If data showed a substance to be bioaccumulative or to have other significant long-term effects, a factor was used to reduce the indicated concentrations to a level presumed to be protective. Criteria for the protection of human health were similarly derived by considering the pollutants' acute, chronic, and bioaccumulative effects on non-human mammals and humans.

Although a continuation of the process of criteria development, the criteria published today were derived using revised methodologies (Guidelines) for calculating the impact of pollutants on human health and aquatic organisms. These Guidelines consist of systematic methods for assessing valid and appropriate data concerning acute and chronic adverse effects of pollutants on aquatic organisms, non-human mammals, and humans. By use of these data in prescribed ways, criteria are formulated to protect aquatic life and human health from exposure to the pollutants. For

some pollutants, bioconcentration properties are used to formulate criteria protective of aquatic life uses. For almost all of the pollutants, bioconcentration properties are used to assess the relative extent of human exposure to the pollutant either directly through ingestion of water or indirectly through consumption of aquatic organisms. Human health criteria for carcinogens are presented as incremental risks to man associated with specific concentrations of the pollutant in ambient water. The Guidelines used to derive criteria protective of aquatic life and human health are fully described in appendices B and C, respectively, of this Notice.

The Agency believes that these Guidelines provide criteria which more accurately reflect the effects of these pollutants on human health and on aquatic organisms and their uses. They are based on a more rational and consistent approach for using scientific data. These Guidelines were developed by EPA scientists in consultation with scientists from outside the Agency and they have been subjected to intensive public comment.

Neither the Guidelines nor the criteria are considered inflexible doctrine. Even at this time, EPA is taking action to employ the resources of peer review groups, including the Science Advisory Board, to evaluate recently published data, and EPA is conducting its own evaluation of new data to determine whether revisions to the criteria documents would be warranted.

The criteria published today are based solely on the effect of a single pollutant. However, pollutants in combination may have different effects because of synergistic, additive, or antagonistic properties. It is impossible in these documents to quantify the combined effects of these pollutants, and persons using criteria should be aware that site-specific analysis of actual combinations of pollutants may be necessary to give more precise indications of the actual environmental impacts of a discharge.

Relationship of the Section 304(a)(1) Criteria to Regulatory Programs

Section 304(a)(1) criteria are not rules and they have no regulatory impact. Rather, these criteria present scientific data and guidance on the environmental effect of pollutants which can be useful to derive regulatory requirements based on considerations of water quality impacts. Under the Clean Water Act, these regulatory requirements may include the promulgation of water quality-based effluent limitations under section 302, water quality standards

under section 303, or toxic pollutant effluent standards under section 307. States are encouraged to begin to modify or, if necessary, develop new programs necessary to support the implementation of regulatory controls for toxic pollutants. As appropriate, States may incorporate criteria for toxic pollutants, based on this guidance, into their water quality standards.

Section 304(a)(1) criteria have been most closely associated with the development of State water quality standards, and the "Red Book" values have, in the past, been the basis for EPA's assessments of the adequacy of State requirements. However, EPA is now completing a major review of its water quality standards policies and regulations. After consideration of comments received on an Advance Notice of Proposed Rulemaking (43 FR 29588, July 10, 1978) and the draft criteria documents, the Agency intends to propose, by the end of this year, a revised water quality standards regulation which will clarify the Agency's position on a number of significant standards issues.

With the publication of these criteria, however, it is appropriate to discuss EPA's current thinking on standards issues relating to their use. This discussion does not establish new regulatory requirements and is intended as guidance on the possible uses of these criteria and an indication of future rulemaking the Agency may undertake. No substantive requirements will be established without further opportunity for public comment.

Water Quality Standards

Section 303 of the Clean Water Act provides that water quality standards be developed for all surface waters. A water quality standard consists basically of two parts: (1) A "designated use" for which the water body is to be protected (such as "agricultural," "recreation" or "fish and wildlife"), and (2) "criteria" which are numerical pollutant concentration limits or narrative statements necessary to preserve or achieve the designated use. A water quality standard is developed through State or Federal rulemaking proceedings and must be translated into enforceable effluent limitations in a point source (NPDES) permit or may form the basis of best management practices applicable to nonpoint sources under section 208 of the Act.

Relationship of Section 304(a)(1) Criteria to the Criteria Component of State Water Quality Standards

In the ANPRM, EPA announced a policy of "presumptive applicability" for

section 304(a)(1) criteria codified in the "Red Book." Presumptive applicability meant that a State had to adopt a criterion for a particular water quality parameter at least as stringent as the recommendation in the Red Book unless the State was able to justify a less stringent criterion based on: natural background conditions, more recent scientific evidence, or local, site-specific information. EPA is rescinding the policy of presumptive applicability because it has proven to be too inflexible in actual practice.

Although the section 304(a)(1) criteria represent a reasonable estimate of pollutant concentrations consistent with the maintenance of designated water uses, States may appropriately modify these values to reflect local conditions. In certain circumstances, the criteria may not accurately reflect the toxicity of a pollutant because of the effect of local water quality characteristics or varying sensitivities of local populations. For example, in some cases, ecosystem adaptation may enable a viable, balanced aquatic population to exist in waters with high natural background levels of certain pollutants. Similarly, certain compounds may be more or less toxic in some waters because of differences in alkalinity, temperature, hardness, and other factors.

Methods for adjusting the section 304(a)(1) criteria to reflect these local differences are discussed below.

Relationship of Section 304(a)(1) Criteria to Designated Water Uses:

The criteria published today can be used to support the designated uses which are generally found in State standards. The following section discusses the relationship between the criteria and individual use classifications. Where a water body is designated for more than one use, criteria necessary to protect the most sensitive use should be applied.

1. *Recreation:* Recreational uses of water include such activities as swimming, wading, boating and fishing. Although insufficient data exist on the effects of toxic pollutants resulting from exposure through such primary contact as swimming, section 304(a)(1) criteria based on human health effects may be used to support this designated use where fishing is included in the State definition of "recreation." In this situation only the portion of the criterion based on fish consumption should be used.

2. *Protection and Propagation of Fish and Other Aquatic Life:* The section 304(a)(1) criteria based on toxicity to aquatic life may be used directly to support this designated use.

3. *Agricultural and Industrial Uses:* The section 304(a)(1) criteria were not specifically developed to reflect the impact of pollutants on agricultural and industrial uses. However, the criteria developed for human health and aquatic life are sufficiently stringent to protect these other uses. States may establish criteria specifically designed to protect these uses.

4. *Public Water Supply:* The drinking water exposure component of the human health effects criteria can apply directly to this use classification or may be appropriately modified depending upon whether the specific water supply system falls within the auspices of the Safe Drinking Water Act's (SDWA) regulatory control, and the type and level of treatment imposed upon the supply before delivery to the consumer. The SDWA controls the presence of toxic pollutants in finished ("end-of-tap") drinking water. A brief description of relevant sections of this Act is necessary to explain how the SDWA will work in conjunction with section 304(a)(1) criteria in protecting human health from the effects of toxics due to consumption of water.

Pursuant to section 1412 of the SDWA, EPA has promulgated "National Interim Primary Drinking Water Standards" for certain organic and inorganic substances. These standards establish "maximum contaminant levels" ("MCLs") which specify the maximum permissible level of a contaminant in water which may be delivered to a user of a public water system now defined as serving a minimum of 25 people. MCLs are established based on consideration of a range of factors including not only the health effects of the contaminants but also technological and economic feasibility of the contaminants' removal from the supply. EPA is required to establish revised primary drinking water regulations based on the effects of a contaminant on human health, and include treatment capability, monitoring availability, and costs. Under Section 1401(1)(D)(i) of the SDWA, EPA is also allowed to establish the minimum quality criteria for water which may be taken into a public water supply system.

Section 304(a)(1) criteria provide estimates of pollutant concentrations protective of human health, but do not consider treatment technology, costs and other feasibility factors. The section 304(a)(1) criteria also include fish bioaccumulation and consumption factors in addition to direct human drinking water intake. These numbers were not developed to serve as "end of tap" drinking water standards, and they have no regulatory significance under

the SDWA. Drinking water standards are established based on considerations, including technological and economic feasibility, not relevant to section 304(a)(1) criteria. Section 304(a)(1) criteria may be analogous to the recommended maximum contaminant levels (RMCLs) under section 1412(b)(1)(B) of the SDWA in which, based upon a report from the National Academy of Sciences, the Administrator should set target levels for contaminants in drinking water at which "no known or anticipated adverse effects occur and which allows an adequate margin of safety". RMCLs do not take treatment, cost, and other feasibility factors into consideration. Section 304(a)(1) criteria are, in concept, related to the health-based goals specified in the RMCLs. Specific mandates of the SDWA such as the consideration of multi-media exposure, as well as different methods for setting maximum contaminant levels under the two Acts, may result in differences between the two numbers.

MCLs of the SDWA, where they exist, control toxic chemicals in finished drinking water. However, because of variations in treatment and the fact that only a relatively small number of MCLs have been developed, ambient water criteria may be used by the States as a supplement to SDWA regulations. States will have the option of applying MCLs, section 304(a)(1) human health effects criteria, modified section 304(a)(1) criteria or controls more stringent than these three to protect against the effects of toxic pollutants by ingestion from drinking water.

For untreated drinking water supplies, States may control toxics in the ambient water through either use of MCLs (if they exist for the pollutants of concern), section 304(a)(1) human health effects criteria, or a more stringent contaminant level than the former two options.

For treated drinking water supplies serving less than 25 people, States may choose toxics control through application of MCLs (if they exist for the pollutants of concern and are attainable by the type of treatment) in the finished drinking water. States also have the options to control toxics in the ambient water by choosing section 304(a)(1) criteria, adjusted section 304(a)(1) criteria resulting from the reduction of the direct drinking water exposure component in the criteria calculation to the extent that the treatment procedure reduces the level of pollutants, or a more stringent contaminant level than the former three options.

For treated drinking water supplies serving 25 people or greater, States must control toxics down to levels at least as stringent as MCLs (where they exist for

the pollutants of concern) in the finished drinking water. However, States also have the options to control toxics in the ambient water by choosing section 304(a)(1) criteria, adjusted section 304(a)(1) criteria resulting from the reduction of the direct drinking water exposure component in the criteria calculation to the extent that the treatment process reduces the level of pollutants, or a more stringent contaminant level than the former three options.

Inclusion of Specific Pollutants in State Standards:

To date, EPA has not required that a State address any specific pollutant in its standards. Although all States have established standards for most conventional pollutants, the treatment of toxic pollutants has been much less extensive. In the ANPRM, EPA suggested a policy under which States would be required to address a set of pollutants and incorporate specific toxic pollutant criteria into water quality standards. If the State failed to incorporate these criteria, EPA would promulgate the standards based upon these criteria pursuant to section 303(c)(4)(B).

In the forthcoming proposed revision to the water quality standard regulations, a significant change in policy will be proposed relating to the incorporation of certain pollutants in State water quality standards. This proposal will differ from the proposal made in the ANPRM. The ANPRM proposed an EPA-published list of pollutants for which States would have had to develop water quality standards. This list might have contained some (or all) of the 65 toxic pollutants. However, the revised water quality standards regulation will propose a process by which EPA will assist States in identifying specific toxic pollutants required for assessment for possible inclusion in State water quality standards. For these pollutants, States will have the option of adopting the published criteria or of adjusting those criteria based on site-specific analysis.

These pollutants would generally represent the greatest threat to sustaining a healthy, balanced ecosystem in water bodies or to human health due to exposure directly or indirectly from water. EPA is currently developing a process to determine which pollutants a State must assess for possible inclusion in its water quality standards. Relevant factors might include the toxicity of the pollutant, the frequency and concentration of its discharge, its geographical distribution, the breadth of data underlying the

scientific assessment of its aquatic life and human health effects, and the technological and economic capacity to control the discharge of the pollutant. For some of the pollutants, all States may be required to assess them for possible inclusion in their standards. For others, assessment would be restricted to States or limited to specific water bodies where the pollutants pose a particular site-specific problem.

Criteria Modification Process

Flexibility is available in the application of these and any other valid water quality criteria to regulatory programs. Although in some cases they may be used by the States as developed, the criteria may be modified to reflect local environmental conditions and human exposure patterns before incorporation into programs such as water quality standards. If significant impacts of site-specific water quality conditions in the toxicities of pollutants can be demonstrated or significantly different exposure patterns of these pollutants to humans can be shown, section 304(a)(1) criteria may be modified to reflect these local conditions. The term "local" may refer to any appropriate geographic area where common aquatic environmental conditions or exposure patterns exist. Thus, "local" may signify a Statewide, regional, river reach, or entire river basin area. On the other hand, the criteria of some pollutants might be applicable nationwide without the need for adaptation to reflect local conditions. The degree of toxicity toward aquatic organisms and humans characteristic of these pollutants would not change significantly due to local water quality conditions.

EPA is examining a series of environmental factors or water quality parameters which might realistically be expected to affect the laboratory-derived water quality criterion recommendation for a specific pollutant. Factors such as hardness, pH, suspended solids, types of aquatic organisms present, etc. could impact on the chemical's effect in the aquatic environment. Therefore, local information can be assembled and analyzed to adjust the criterion recommendation if necessary.

The Guidelines for deriving criteria for the protection of aquatic life suggest several approaches for modifying the criteria. First, toxicity data, both acute and chronic, for local species could be substituted for some or all of the species used in deriving criteria for the water quality standard. The minimum data requirements should still be fulfilled in calculating a revised criterion. Second,

criteria may be specifically tailored to a local water body by use of data from toxicity tests performed with that ambient water. A procedure such as this would account for local environmental conditions in formulating a criterion relevant to the local water body. Third, site-specific water quality characteristics resulting in either enhancement or mitigation of aquatic life toxicity for the pollutant could be factored into final formulation of the criterion. Finally, the criteria may be made more stringent to ensure protection of an individual species not otherwise adequately protected by any of the three modification procedures previously mentioned.

EPA does not intend to have States assess every local stream segment and lake in the country on an individual basis before determining if an adjustment is necessary. Rather, it is envisioned that water bodies having similar hydrological, chemical, physical, and biological properties will be grouped for the purpose of criteria adjustment. The purpose of this effort is to assist States in adapting the section 304(a) criteria to local conditions where needed, thereby precluding the setting of arbitrary and perhaps unnecessarily stringent or underprotective criteria in a water body. In all cases, EPA will still be required, pursuant to section 303(c), to determine whether the State water quality standards are consistent with the goals of the Act, including a determination of whether State-established criteria are adequate to support a designated use.

Criteria for the Protection of Aquatic Life

Interpretation of the Criteria

The aquatic life criteria issued today are summarized in Appendix A of this Federal Register notice. Criteria have been formulated by applying a set of Guidelines to a data base for each pollutant. The criteria for the protection of aquatic life specify pollutant concentrations which, if not exceeded, should protect most, but not necessarily all, aquatic life and its uses. The Guidelines specify that criteria should be based on an array of data from organisms, both plant and animal, occupying various trophic levels. Based on these data, criteria can be derived which should be adequate to protect the types of organisms necessary to support an aquatic community.

The Guidelines are not designed to derive criteria which will protect all life stages of all species under all conditions. Generally some life stage of one or more tested species, and

probably some untested species, will have sensitivities below the maximum value or the 24-hour average under some conditions and would be adversely affected if the highest allowable pollutant concentrations and the worst conditions existed for a long time. In actual practice, such a situation is not likely to occur and thus the aquatic community as a whole will normally be protected if the criteria are not exceeded. In any aquatic community there is a wide range of individual species sensitivities to the effects of toxic pollutants. A criterion adequate to protect the most susceptible life stage of the most sensitive species would in many cases be more stringent than necessary to protect the overall aquatic community.

The aquatic life criteria specify both maximum and 24-hour average values. The combination of the two values is designed to provide adequate protection of aquatic life and its uses from acute and chronic toxicity and bioconcentration without being as restrictive as a one-number criterion would have to be to provide the same amount of protection. A time period of 24 hours was chosen in order to ensure that concentrations not reach harmful levels for unacceptably long periods. Averaging for longer periods, such as a week or a month for example, could permit high concentrations to persist long enough to produce significant adverse effects. A 24-hour period was chosen instead of a slightly longer or shorter period in recognition of daily fluctuations in waste discharges and of the influence of daily cycles of sunlight and darkness and temperature on both pollutants and aquatic organisms.

The maximum value, which is derived from acute toxicity data, prevents significant risk of adverse impact to organisms exposed to concentrations above the 24-hour average. Merely specifying the average value over a specified time period is insufficient because concentrations of chemicals higher than the average value can kill or cause irreparable damage in short periods. Furthermore, for some chemicals the effect of intermittent high exposures is cumulative. It is therefore necessary to place an upper limit on pollutant concentrations to which aquatic organisms might be exposed. The two-number criterion is intended to describe the highest average ambient water concentration which will produce a water quality generally suited to the maintenance of aquatic life while restricting the extent and duration of the excursions over that average to levels which will not cause harm. The only

way to assure the same degree of protection with a one-number criterion would be to use the 24-hour average as a concentration that is not to be exceeded at any time in any place.

Since some substances may be more toxic in freshwater than in saltwater, or vice versa, provision is made for deriving separate water quality criteria for freshwater and for saltwater for each substance. However, for some substances sufficient data may not be available to derive one or both of these criteria using the Guidelines.

Specific aquatic life criteria have not been developed for all of the 65 toxic pollutants. In those cases where there were insufficient data to allow the derivation of a criterion, narrative descriptions of apparent threshold levels for acute and/or chronic effects based on the available data are presented. These descriptions are intended to convey a sense of the degree of toxicity of the pollutant in the absence of a criterion recommendation.

Summary of the Aquatic Life Guidelines

The Guidelines for Deriving Water Quality Criteria for the Protection of Aquatic Life and its Uses were developed to describe an objective, internally consistent, and appropriate way of ensuring that water quality criteria for aquatic life would provide, on the average, a reasonable amount of protection without an unreasonable amount of overprotection or underprotection. The resulting criteria are not intended to provide 100 percent protection of all species and all uses of aquatic life all of the time, but they are intended to protect most species in a balanced, healthy aquatic community. The Guidelines are published as Appendix B of this Notice. Responses to public comments on these Guidelines are attached as Appendix D.

Minimum data requirements are identified in four areas: acute toxicity to animals (eight data points), chronic toxicity to animals (three data points), toxicity to plants, and residues. Guidance is also given for discarding poor quality data.

Data on acute toxicity are needed for a variety of fish and invertebrate species and are used to derive a Final Acute Value. By taking into account the number and relative sensitivities of the tested species, the Final Acute Value is designed to protect most, but not necessarily all, of the tested and untested species.

Data on chronic toxicity to animals can be used to derive a Final Chronic Value by two different means. If chronic values are available for a specified number and array of species, a final

chronic value can be calculated directly. If not, an acute-chronic ratio is derived and then used with the Final Acute Value to obtain the Final Chronic Value.

The Final Plant Value is obtained by selecting the lowest plant toxicity value based on measured concentrations.

The Final Residue Value is intended to protect wildlife which consume aquatic organisms and the marketability of aquatic organisms. Protection of the marketability of aquatic organisms is, in actuality, protection of a use of that water body ("commercial fishery"). Two kinds of data are necessary to calculate the Final Residue Value: a bioconcentration factor (BCF) and a maximum permissible tissue concentration, which can be an FDA action level or can be the result of a chronic wildlife feeding study. For lipid soluble pollutants, the BCF is normalized for percent lipids and then the Final Residue Value is calculated by dividing the maximum permissible tissue concentration by the normalized BCF and by an appropriate percent lipid value. BCFs are normalized for percent lipids since the BCF measured for any individual aquatic species is generally proportional to the percent lipids in that species.

If sufficient data are available to demonstrate that one or more of the final values should be related to a water quality characteristic, such as salinity, hardness, or suspended solids, the final value(s) are expressed as a function of that characteristic.

After the four final values (Final Acute Value, Final Chronic Value, Final Plant Value, and Final Residue Value) have been obtained, the criterion is established with the Final Acute Value becoming the maximum value and the lowest of the other three values becoming the 24-hour average value. All of the data used to calculate the four final values and any additional pertinent information are then reviewed to determine if the criterion is reasonable. If sound scientific evidence indicates that the criterion should be raised or lowered, appropriate changes are made as necessary.

The present Guidelines have been revised from the earlier published versions (43 FR 21506, May 18, 1978; 43 FR 29028, July 5, 1978; 44 FR 15928, March 15, 1979). Details have been added in many places and the concept of a minimum data base has been incorporated. In addition, three adjustment factors and the species sensitivity factor have been deleted. These modifications were the result of the Agency's analysis of public comments and comments received from the Science Advisory Board on earlier

versions of the Guidelines. These comments and the Resultant modifications are addressed fully in Appendix D to this notice.

Criteria for the Protection of Human Health

Interpretation of the Human Health Criteria

The human health criteria issued today are summarized in Appendix A of this Federal Register notice. Criteria for the protection of human health are presented for 62 of the 65 pollutants based on their carcinogenic, toxic, or organoleptic (taste and odor) properties. The meanings and practical uses of the criteria values are distinctly different depending on the properties on which they are based.

The objective of the health assessment portions of the criteria documents is to estimate ambient water concentrations which, in the case of non-carcinogens, prevent adverse health effects in humans, and in the case of suspect or proven carcinogens, represent various levels of incremental cancer risk.

Health assessments typically contain discussions of four elements: Exposure, pharmacokinetics, toxic effects, and criterion formulation.

The exposure section summarizes information on exposure routes: ingestion directly from water, indirectly from consumption of aquatic organisms found in ambient water, other dietary sources, inhalation, and dermal contact. Exposure assumptions are used to derive human health criteria. Most criteria are based solely on exposure from consumption of water containing a specified concentration of a toxic pollutant and through consumption of aquatic organisms which are assumed to have bioconcentrated pollutants from the water in which they live. Other multimedia routes of exposure such as air, non-aquatic diet, or dermal are not factored into the criterion formulation for the vast majority of pollutants due to lack of data. The criteria are calculated using the combined aquatic exposure pathway and also using the aquatic organism ingestion exposure route alone. In criteria reflecting both the water consumption and aquatic organism ingestion routes of exposure, the relative exposure contribution varies with the propensity of a pollutant to bioconcentrate, with the consumption of aquatic organisms becoming more important as the bioconcentration factor (BCF) increases. As additional information on total exposure is assembled for pollutants for which criteria reflect only the two specified

aquatic exposure routes, adjustments in water concentration values may be made. The Agency intends to publish guidance which will permit the States to identify significantly different exposure patterns for their populations. If warranted by the demonstration of significantly different exposure patterns, this will become an element of a process to adapt/modify human health-based criteria to local conditions, somewhat analogous to the aquatic life criteria modification process discussed previously. It is anticipated that States at their discretion will be able to set appropriate human health criteria based on this process.

The pharmacokinetics section reviews data on absorption, distribution, metabolism, and excretion to assess the biochemical fate of the compounds in the human and animal system. The toxic effects section reviews data on acute, subacute, and chronic toxicity, synergistic and antagonistic effects, and specific information on mutagenicity, teratogenicity, and carcinogenicity. From this review, the toxic effect to be protected against is identified taking into account the quality, quantity, and weight of evidence characteristic of the data. The criterion formulation section reviews the highlights of the text and specifies a rationale for criterion development and the mathematical derivation of the criterion number.

Within the limitations of time and resources, current published information of significance was incorporated into the human health assessments. Review articles and reports were used for data evaluation and synthesis. Scientific judgment was exercised in reviewing and evaluating the data in each criteria document and in identifying the adverse effects for which protective criteria were published.

Specific health-based criteria are developed only if a weight of evidence supports the occurrence of the toxic effect; and if dose/response data exist from which criteria can be estimated.

Criteria for suspect or proven carcinogens are presented as concentrations in water associated with a range of incremental cancer risks to man. Criteria for non-carcinogens represent levels at which exposure to a single chemical is not anticipated to produce adverse effects in man. In a few cases, organoleptic (taste and odor) data form the basis for the criterion. While this type of criterion does not represent a value which directly affects human health, it is presented as an estimate of the level of a pollutant that will not produce unpleasant taste or odor either directly from water consumption or indirectly by consumption of aquatic

organisms found in ambient waters. A criterion developed in this manner is judged to be as useful as other types of criteria in protecting designated water uses. In addition, where data are available, toxicity-based criteria are also presented for pollutants with derived organoleptic criteria. The choice of criteria used in water quality standards for these pollutants will depend upon the designated use to be protected. In the case of a multiple use water body, the criterion protecting the most sensitive use will be applied. Finally, for several pollutants no criteria are recommended due to a lack of information sufficient for quantitative criterion formulation.

Risk Extrapolation

Because methods do not now exist to establish the presence of a threshold for carcinogenic effects, EPA's policy is that there is no scientific basis for estimating "safe" levels for carcinogens. The criteria for carcinogens, therefore, state that the recommended concentration for maximum protection of human health is zero. In addition, the Agency has presented a range of concentrations corresponding to incremental cancer risks of 10^{-7} to 10^{-6} (one additional case of cancer in populations ranging from ten million to 100,000, respectively). Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Summary of the Human Health Guidelines

The health assessments and corresponding criteria published today were derived based on *Guidelines and Methodology Used in the Preparation of Health Effect Assessment Chapters of the Consent Decree Water Criteria Documents* (the Guidelines) developed by EPA's Office of Research and Development. The estimation of health risks associated with human exposure to environmental pollutants requires predicting the effect of low doses for up to a lifetime in duration. A combination of epidemiological and animal dose/response data is considered the preferred basis for quantitative criterion derivation. The complete Guidelines are presented as Appendix C. Major issues associated with these Guidelines and responses to public comments are presented as Appendix E.

No-effect (non-carcinogen) or specified risk (carcinogen) concentrations were estimated by extrapolation from animal toxicity or

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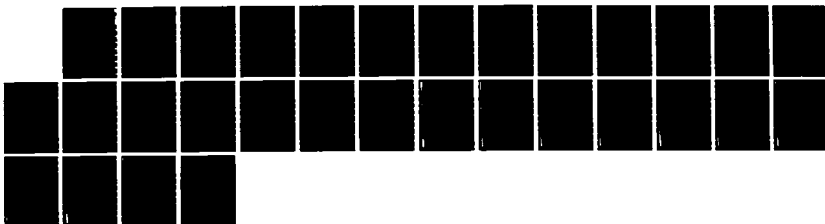
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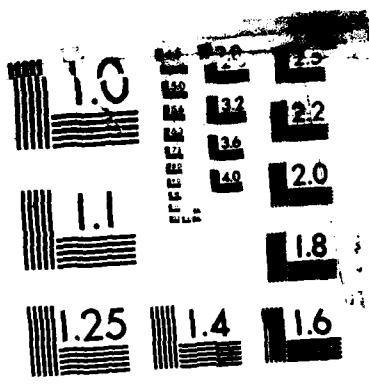
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human epidemiology studies using the following basic exposure assumptions: a 70-kilogram male person (*Report of the Task Group on Reference Man*, International Commission for Radiation Protection, November 23, 1957) as the exposed individual; the average daily consumption of freshwater and estuarine fish and shellfish products equal to 8.5 grams/day; and the average ingestion of two liters/day of water (*Drinking Water and Health*, National Academy of Sciences, National Research Council, 1977). Criteria based on these assumptions are estimated to be protective of an adult male who experiences average exposure conditions.

Two basic methods were used to formulate health criteria, depending on whether the prominent adverse effect was cancer or other toxic manifestations. The following sections detail these methods.

Carcinogens

Extrapolation of cancer responses from high to low doses and subsequent risk estimation from animal data is performed using a linearized multi-stage model. This procedure is flexible enough to fit all monotonically-increasing dose response data, since it incorporates several adjustable parameters. The multi-stage model is a linear non-threshold model as was the "one-hit" model originally used in the proposed criteria documents. The linearized multi-stage model and its characteristics are described fully in Appendix C. The linear non-threshold concept has been endorsed by the four agencies in the Interagency Regulatory Liaison Group and is less likely to underestimate risk at the low doses typical of environmental exposure than other models that could be used. Because of the uncertainties associated with dose response, animal-to-human extrapolation and other unknown factors, because of the use of average exposure assumptions, and because of the serious public health consequences that could result if risk were underestimated, EPA believes that it is prudent to use conservative methods to estimate risk in the water quality criteria program. The linearized multistage model is more systematic and invokes fewer arbitrary assumptions than the "one-hit" procedure previously used.

It should be noted that extrapolation models provide estimates of risk since a variety of assumptions are built into any model. Models using widely different assumptions may produce estimates ranging over several orders of magnitude. Since there is at present no

way to demonstrate the scientific validity of any model, the use of risk extrapolation models is a subject of debate in the scientific community. However, risk extrapolation is generally recognized as the only tool available at this time for estimating the magnitude of health hazards associated with non-threshold toxicants and has been endorsed by numerous Federal agencies and scientific organizations, including EPA's Carcinogen Assessment Group, the National Academy of Sciences, and the Interagency Regulatory Liaison Group as a useful means of assessing the risks of exposure to various carcinogenic pollutants.

Non-Carcinogens

Health criteria based on toxic effects of pollutants other than carcinogenicity are estimates of concentrations which are not expected to produce adverse effects in humans. They are based upon Acceptable Daily Intake (ADI) levels and are generally derived using no-observed-adverse-effect-level (NOAEL) data from animal studies although human data are used wherever available. The ADI is calculated using safety factors to account for uncertainties inherent in extrapolation from animal to man. In accordance with the National Research Council recommendations (*Drinking Water and Health*, National Academy of Sciences, National Research Council, 1977), safety factors of 10, 100, or 1,000 are used depending on the quality and quantity of data. In some instances extrapolations are made from inhalation studies or limits to approximate a human response from ingestion using the Stokinger-Woodward model (Journal of American Water Works Association, 1958). Calculations of criteria from ADIs are made using the standard exposure assumptions (2 liters of water, 8.5 grams of edible aquatic products, and an average body weight of 70 kg).

Dated: October 24, 1980.

Douglas M. Costle,
Administrator.

Appendix A—Summary of Water Quality Criteria

Acenaphthene

Freshwater Aquatic Life

The available data for acenaphthene indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 1,700 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of acenaphthene to sensitive freshwater aquatic animals but

toxicity to freshwater algae occur at concentrations as low as 520 µg/l.

Saltwater Aquatic Life

The available data for acenaphthene indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations as low as 970 and 710 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested. Toxicity to algae occurs at concentrations as low as 500 µg/l.

Human Health

Sufficient data is not available for acenaphthene to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 20 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Acrolein

Freshwater Aquatic Life

The available data for acrolein indicate that acute and chronic toxicity to freshwater aquatic life occurs at concentrations as low as 68 and 21 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for acrolein indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 55 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of acrolein to sensitive saltwater aquatic life.

Human Health

For the protection of human health from the toxic properties of acrolein ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 320 µg/l.

For the protection of human health from the toxic properties of acrolein ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 780 µg/l.

Acrylonitrile

Freshwater Aquatic Life

The available data for acrylonitrile indicate that acute toxicity to freshwater aquatic life occurs at concentrations as

low as 7,800 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No definitive data are available concerning the chronic toxicity of acrylonitrile to sensitive freshwater aquatic life but mortality occurs at concentrations as low as 2,800 µg/l with a fish species exposed for 30 days.

Saltwater Aquatic Life

Only one saltwater species has been tested with acrylonitrile and no statement can be made concerning acute or chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of acrylonitrile through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are .58 µg/l, .058 µg/l and .006 µg/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 6.5 µg/l, .65 µg/l, and .065 µg/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Aldrin-Dieldrin

Dieldrin

Freshwater Aquatic Life

For dieldrin the criterion to protect fresh water aquatic life as derived using the Guidelines is 0.0019 µg/l as a 24-hour average and the concentration should not exceed 2.5 µg/l at any time.

Saltwater Aquatic Life

For dieldrin the criterion to protect saltwater aquatic life as derived using the Guidelines is 0.0019 µg/l as a 24-hour average and the concentration should not exceed 0.71 µg/l at any time.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of dieldrin through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold

assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are .71 ng/l, .071 ng/l, and .0071 ng/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are .78 ng/l, .078 ng/l, and .0078 ng/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Aldrin

Freshwater Aquatic Life

For freshwater aquatic life the concentration of aldrin should not exceed 3.0 µg/l at any time. No data are available concerning the chronic toxicity of aldrin to sensitive freshwater aquatic life.

Saltwater Aquatic Life

For saltwater aquatic life the concentration of aldrin should not exceed 1.3 µg/l at any time. No data are available concerning the chronic toxicity of aldrin to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of aldrin through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are .74 ng/l, .074 ng/l, and .0074 ng/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are .79 ng/l, .079 ng/l, and .0079 ng/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Antimony

Freshwater Aquatic Life

The available data for antimony indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 8,000 and 1,800 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested. Toxicity to algae occurs at concentrations as low as 610 µg/l.

Saltwater Aquatic Life

No saltwater organisms have been adequately tested with antimony, and no statement can be made concerning acute or chronic toxicity.

Human Health

For the protection of human health from the toxic properties of antimony ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 146 µg/l.

For the protection of human health from the toxic properties of antimony ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 45,000 µg/l.

Arsenic

Freshwater Aquatic Life

For freshwater aquatic life the concentration of total recoverable trivalent inorganic arsenic should not exceed 440 µg/l at any time. Short-term effects on embryos and larvae of aquatic vertebrate species have been shown to occur at concentrations as low as 40 µg/l.

Saltwater Aquatic Life

The available data for total recoverable trivalent inorganic arsenic indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 508 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of trivalent inorganic arsenic to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of arsenic through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are

estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 22 ng/l, 2.2 ng/l, and .22 ng/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 175 ng/l, 17.5 ng/l, and 1.75 ng/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Asbestos

Freshwater Aquatic Life

No freshwater organisms have been tested with any asbestiform mineral and no statement can be made concerning acute or chronic toxicity.

Saltwater Aquatic Life

No saltwater organisms have been tested with any asbestiform mineral and no statement can be made concerning acute or chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of asbestos through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 300,000 fibers/l, 30,000 fibers/l, and 3,000 fibers/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Benzene

Freshwater Aquatic Life

The available data for benzene indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 3,300 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of benzene to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for benzene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as

low as 3,100 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No definitive data are available concerning the chronic toxicity of benzene to sensitive saltwater aquatic life, but adverse effects occur at concentrations as low as 700 µg/l with a fish species exposed for 168 days.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of benzene through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 6.6 µg/l, .66 µg/l, and .066 µg/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 400 µg/l, 40.0 µg/l, and 4.0 µg/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Benzidine

Freshwater Aquatic Life

The available data for benzidine indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 2,500 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of benzidine to sensitive freshwater aquatic life.

Saltwater Aquatic Life

No saltwater organisms have been tested with benzidine and no statement can be made concerning acute and chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of benzidine through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of

cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 1.2 ng/l, .12 ng/l, and .01 ng/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 5.3 ng/l, .53 ng/l, and .05 ng/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Beryllium

Freshwater Aquatic Life

The available data for beryllium indicate that acute and chronic toxicity to freshwater aquatic life occurs at concentrations as low as 130 and 5.3 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested. Hardness has a substantial effect on acute toxicity.

Saltwater Aquatic Life

The limited saltwater data base available for beryllium does not permit any statement concerning acute or chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of beryllium through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 37 ng/l, 3.7 ng/l, and .37 ng/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 641 ng/l, 64.1 ng/l, and 6.41 ng/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Cadmium

Freshwater Aquatic Life

For total recoverable cadmium the criterion (in µg/l) to protect freshwater aquatic life as derived using the Guidelines is the numerical value given

by $c \times 10^{-6}$ (the hardness) $\times 10^{-6}$ as a 24-hour average and the concentration (in $\mu\text{g/l}$) should not exceed the numerical value given by $c \times 10^{-6}$ (the hardness) $\times 10^{-6}$ at any time. For example, a hardnesses of 50, 100, and 200 mg/l as CaCO_3 , the criteria are 0.012, 0.025, and 0.051 $\mu\text{g/l}$, respectively, and the concentration of total recoverable cadmium should not exceed 1.5, 3.0 and 6.3 $\mu\text{g/l}$ respectively, at any time.

Saltwater Aquatic Life

For total recoverable cadmium the criterion to protect saltwater aquatic life as derived using the Guidelines is 4.5 $\mu\text{g/l}$ as a 24-hour average and the concentration should not exceed 80 $\mu\text{g/l}$ at any time.

Human Health

The ambient water quality criterion for cadmium is recommended to be identical to the existing drinking water standard which is 10 $\mu\text{g/l}$. Analysis of the toxic effects data resulted in a calculated level which is protective of human health against the ingestion of contaminated water and contaminated aquatic organisms. The calculated value is comparable to the present standard. For this reason a selective criterion based on exposure solely from consumption of 6.5 grams of aquatic organisms was not derived.

Carbon Tetrachloride

Freshwater Aquatic Life

The available data for carbon tetrachloride indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 35,200 $\mu\text{g/l}$ and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of carbon tetrachloride to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for carbon tetrachloride indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 50,000 $\mu\text{g/l}$ and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of carbon tetrachloride to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of carbon tetrachloride through ingestion of contaminated water and contaminated aquatic organisms the ambient water concentration should be zero based on

the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-5} , 10^{-6} , and 10^{-7} . The corresponding criteria are 4.0 $\mu\text{g/l}$, .40 $\mu\text{g/l}$, and .04 $\mu\text{g/l}$, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 68.4 $\mu\text{g/l}$, 6.84 $\mu\text{g/l}$, and .68 $\mu\text{g/l}$, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Chlordane

Freshwater Aquatic Life

For chlordane the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.0043 $\mu\text{g/l}$ as a 24-hour average and the concentration should not exceed 2.4 $\mu\text{g/l}$ at any time.

Saltwater Aquatic Life

For chlordane the criterion to protect saltwater aquatic life as derived using the Guidelines is 0.0040 $\mu\text{g/l}$ as a 24-hour average and the concentration should not exceed 0.09 $\mu\text{g/l}$ at any time.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of chlordane through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-5} , 10^{-6} , and 10^{-7} . The corresponding criteria are 4.8 ng/l , .48 ng/l , and .048 ng/l , respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 4.8 ng/l , .48 ng/l , and .048 ng/l , respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Chlorinated Benzenes

Freshwater Aquatic Life

The available data for chlorinated benzenes indicate that acute toxicity to freshwater aquatic life occurs at

concentrations as low as 250 $\mu\text{g/l}$ and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of the more toxic of the chlorinated benzenes to sensitive freshwater aquatic life but toxicity occurs at concentrations as low as 80 $\mu\text{g/l}$ for a fish species exposed for 7.5 days.

Saltwater Aquatic Life

The available data for chlorinated benzenes indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations as low as 180 and 129 $\mu\text{g/l}$, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of hexachlorobenzene through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-5} , 10^{-6} , and 10^{-7} . The corresponding recommended criteria are 7.2 ng/l , .72 ng/l , and .072 ng/l , respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 7.4 ng/l , .74 ng/l , and .074 ng/l , respectively.

For the protection of human health from the toxic properties of 1,2,4,5-tetrachlorobenzene ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 38 $\mu\text{g/l}$.

For the protection of human health from the toxic properties of 1,2,4,5-tetrachlorobenzene ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 48 $\mu\text{g/l}$.

For the protection of human health from the toxic properties of pentachlorobenzene ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 74 $\mu\text{g/l}$.

For the protection of human health from the toxic properties of pentachlorobenzene ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 85 $\mu\text{g/l}$.

Using the present guidelines, a satisfactory criterion cannot be derived

at this time due to the insufficiency in the available data for trichlorobenzene.

For comparison purposes, two approaches were used to derive criterion levels for monochlorobenzene. Based on available toxicity data, for the protection of public health, the derived level is 488 µg/L. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 20 µg/L. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Chlorinated-Ethanes

Freshwater Aquatic Life

The available freshwater data for chlorinated ethanes indicate that toxicity increases greatly with increasing chlorination, and that acute toxicity occurs at concentrations as low as 118,000 µg/L for 1,2-dichloroethane, 18,000 µg/L for two trichloroethanes, 9,320 µg/L for two tetrachloroethanes, 7,240 µg/L for pentachloroethane, and 980 µg/L for hexachloroethane. Chronic toxicity occurs at concentrations as low as 20,000 µg/L for 1,2-dichloroethane, 8,400 µg/L for 1,1,2-trichloroethane, 2,400 µg/L for 1,1,2,2-tetrachloroethane, 1,100 µg/L for pentachloroethane, and 540 µg/L for hexachloroethane. Acute and chronic toxicity would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available saltwater data for chlorinated ethanes indicate that toxicity increases greatly with increasing chlorination and that acute toxicity to fish and invertebrate species occurs at concentrations as low as 113,000 µg/L for 1,2-dichloroethane, 31,200 µg/L for 1,1,1-trichloroethane, 9,020 µg/L for 1,1,2,2-tetrachloroethane, 360 µg/L for pentachloroethane, and 940 µg/L for hexachloroethane. Chronic toxicity occurs at concentrations as low as 281 µg/L for pentachloroethane. Acute and chronic toxicity would occur at lower concentrations among species that are more sensitive than those tested.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of 1,2-dichloroethane through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this

chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 8.4 µg/L, 94 µg/L and .004 µg/L respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 2,430 µg/L, 243 µg/L and 24.3 µg/L respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the protection of human health from the toxic properties of 1,1,1-trichloroethane ingested through water and contaminated aquatic organism, the ambient water criterion is determined to be 18.4 mg/L.

For the protection of human health from the toxic properties of 1,1,1-trichloroethane ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 1.03 g/L.

For the maximum protection of human health from the potential carcinogenic effects due to exposure of 1,1,2-trichloroethane through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time.

Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 8.0 µg/L, 8 µg/L, and .08 µg/L respectively.

If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 418 µg/L, 41.8 µg/L, and 4.18 µg/L respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure of 1,1,2,2-tetrachloroethane through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} ,

and 10^{-4} . The corresponding criteria are 1.7 µg/L, .17 µg/L, and .017 µg/L respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 107 µg/L, 10.7 µg/L, and 1.07 µg/L respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure of hexachloroethane through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time.

Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 19 µg/L, 1.9 µg/L, and .19 µg/L respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 87.4 µg/L, 8.74 µg/L, and .87 µg/L respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for monochloroethane.

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for 1,1-dichloroethane.

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for 1,1,1,2-tetrachloroethane.

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for pentachloroethane.

Chlorinated Naphthalenes

Freshwater Aquatic Life

The available data for chlorinated naphthalenes indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 1,800 µg/L and would occur at lower concentrations among species that are

more sensitive than those tested. No data are available concerning the chronic toxicity of chlorinated naphthalenes to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for chlorinated naphthalenes indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 7.5 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of chlorinated naphthalenes to sensitive saltwater aquatic life.

Human Health

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for chlorinated naphthalenes.

Chlorinated Phenols

Freshwater Aquatic Life

The available freshwater data for chlorinated phenols indicate that toxicity generally increases with increasing chlorination, and that acute toxicity occurs at concentrations as low as 30 µg/l for 4-chloro-3-methylphenol to greater than 500,000 µg/l for other compounds. Chronic toxicity occurs at concentrations as low as 970 µg/l for 2,4,6-trichlorophenol. Acute and chronic toxicity would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available saltwater data for chlorinated phenols indicate that toxicity generally increases with increasing chlorination and that acute toxicity occurs at concentrations as low as 440 µg/l for 2,3,5,6-tetrachlorophenol and 29,700 µg/l for 4-chlorophenol. Acute toxicity would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of chlorinated phenols to sensitive saltwater aquatic life.

Human Health

Sufficient data is not available for 3-monochlorophenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 0.1 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no

demonstrated relationship to potential adverse human health effects.

Sufficient data is not available for 4-monochlorophenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 0.1 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Sufficient data is not available for 2,3-dichlorophenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is .04 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Sufficient data is not available for 2,5-dichlorophenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is .5 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Sufficient data is not available for 2,6-dichlorophenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 2 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Sufficient data is not available for 3,4-dichlorophenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is .3 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Sufficient data is not available for 2,3,4,6-tetrachlorophenol to derive a

level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 1 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

For comparison purposes, two approaches were used to derive criterion levels for 2,4,5-trichlorophenol. Based on available toxicity data, for the protection of public health, the derived level is 2.6 mg/l. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 1.0 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

For the maximum protection of human health from the potential carcinogenic effects due to exposure of 2,4,6-trichlorophenol through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 12 µg/l, 1.2 µg/l, and .12 µg/l respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 36 µg/l, 3.6 µg/l, and .36 µg/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 2 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criterion have limitations and have no demonstrated relationship to potential adverse human health effects.

Sufficient data is not available for 2-methyl-4-chlorophenol to derive a level which would protect against any potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 1800 µg/l. It should be

recognized that organoleptic data as a basis for establishing a water quality criterion have limitations and have no demonstrated relationship to potential adverse human health effects.

Sufficient data is not available for 3-methyl-4-chlorophenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 3000 µg/L. It should be recognized that organoleptic data as a basis for establishing a water quality criterion have limitations and have no demonstrated relationship to potential adverse human health effects.

Sufficient data is not available for 3-methyl-5-chlorophenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 20 µg/L. It should be recognized that organoleptic data as a basis for establishing a water quality criterion have limitations and have no demonstrated relationship to potential adverse human health effects.

Chloroalkyl Ethers

Freshwater Aquatic Life

The available data for chloroalkyl ethers indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 238,000 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No definitive data are available concerning the chronic toxicity of chloroalkyl ethers to sensitive freshwater aquatic life.

Saltwater Aquatic Life

No saltwater organisms have been tested with any chloroalkyl ether and no statement can be made concerning acute and chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of bis-(chloromethyl)-ether through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are .038 ng/L, .0038 ng/L, and .00038 ng/L, respectively.

If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 18.4 ng/L, 1.84 ng/L, and .184 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure of bis (2-chloroethyl) ether through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are .3 µg/L, .03 µg/L, and .003 µg/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 13.8 µg/L, 1.38 µg/L, and .138 µg/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the protection of human health from the toxic properties of bis (2-chloroisopropyl) ether ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 34.7 µg/L.

For the protection of human health from the toxic properties of bis (2-chloroisopropyl) ether ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 4.36 mg/L.

Chloroform

Freshwater Aquatic Life

The available data for chloroform indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 28,900 µg/L, and would occur at lower concentrations among species that are more sensitive than the three tested species. Twenty-seven-day LC50 values indicate that chronic toxicity occurs at concentrations as low as 1,240 µg/L, and could occur at lower concentrations among species or other life stages that are more sensitive than the earliest life cycle stage of the rainbow trout.

Saltwater Aquatic Life

The data base for saltwater species is limited to one test and no statement can be made concerning acute or chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of chloroform through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 1.90 µg/L, .19 µg/L, and .019 µg/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 157 µg/L, 15.7 µg/L, and 1.57 µg/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

2-Chlorophenol

Freshwater Aquatic Life

The available data for 2-chlorophenol indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 4,380 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No definitive data are available concerning the chronic toxicity of 2-chlorophenol to sensitive freshwater aquatic life but flavor impairment occurs in one species of fish at concentrations as low as 2,000 µg/L.

Saltwater Aquatic Life

No saltwater organisms have been tested with 2-chlorophenol and no statement can be made concerning acute and chronic toxicity.

Human Health

Sufficient data is not available for 2-chlorophenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 0.1 µg/L. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no

demonstrated relationship to potential adverse human health effects.

Chromium

Freshwater Aquatic Life

For total recoverable hexavalent chromium the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.29 µg/l as a 24-hour average and the concentration should not exceed 21 µg/l at any time.

For freshwater aquatic life the concentration (in µg/l) of total recoverable trivalent chromium should not exceed the numerical value given by " $e(1.08[\ln(\text{hardness})] + 3.48)$ " at any time. For example, at hardnesses of 80, 100 and 200 mg/l as CaCO₃, the concentration of total recoverable trivalent chromium should not exceed 2,200, 4,700, and 9,900 µg/l, respectively, at any time. The available data indicate that chronic toxicity to freshwater aquatic life occurs at concentrations as low as 44 µg/l and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

For total recoverable hexavalent chromium the criterion to protect saltwater aquatic life as derived using the Guidelines is 18 µg/l as a 24-hour average and the concentration should not exceed 1,280 µg/l at any time.

For total recoverable trivalent chromium, the available data indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 10,300 µg/l, and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of trivalent chromium to sensitive saltwater aquatic life.

Human Health

For the protection of human health from the toxic properties of Chromium III ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 170 mg/l.

For the protection of human health from the toxic properties of Chromium III ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 3433 mg/l.

The ambient water quality criterion for total Chromium VI is recommended to be identical to the existing drinking water standard which is 50 µg/l. Analysis of the toxic effects data resulted in a calculated level which is protective of human health against the ingestion of contaminated water and contaminated aquatic organisms. The

calculated value is comparable to the present standard. For this reason a selective criterion based on exposure solely from consumption of 6.5 grams of aquatic organisms was not derived.

Copper

Freshwater Aquatic Life

For total recoverable copper the criterion to protect freshwater aquatic life as derived using the Guidelines is 5.6 µg/l as a 24-hour average and the concentration (in µg/l) should not exceed the numerical value given by $e(0.94[\ln(\text{hardness})] - 1.23)$ at any time. For example, at hardnesses of 80, 100, and 200 mg/l CaCO₃, the concentration of total recoverable copper should not exceed 12, 22, and 43 µg/l at any time.

Saltwater Aquatic Life

For total recoverable copper the criterion to protect saltwater aquatic life as derived using the Guidelines is 4.0 µg/l as a 24-hour average and the concentration should not exceed 23 µg/l at any time.

Human Health

Sufficient data is not available for copper to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 1 mg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Cyanide

Freshwater Aquatic Life

For free cyanide (sum of cyanide present as HCN and CN⁻, expressed as CN) the criterion to protect freshwater aquatic life as derived using the Guidelines is 3.5 µg/l as a 24-hour average and the concentration should not exceed 52 µg/l at any time.

Saltwater Aquatic Life

The available data for free cyanide (sum of cyanide present as HCN and CN⁻, expressed as CN) indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 30 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. If the acute-chronic ratio for saltwater organisms is similar to that for freshwater organisms, chronic toxicity would occur at concentrations as low as 2.0 µg/l for the tested species and at lower concentrations among species

that are more sensitive than those tested.

Human Health

The ambient water quality criterion for cyanide is recommended to be identical to the existing drinking water standard which is 200 µg/l. Analysis of the toxic effects data resulted in a calculated level which is protective of human health against the ingestion of contaminated water and contaminated aquatic organisms. The calculated value is comparable to the present standard. For this reason a selective criterion based on exposure solely from consumption of 6.5 grams of aquatic organisms was not derived.

DDT and Metabolites

Freshwater Aquatic Life

DDT

For DDT and its metabolites the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.0010 µg/l as a 24-hour average and the concentration should not exceed 1.1 µg/l at any time.

TDE

The available data for TDE indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 0.8 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of TDE to sensitive freshwater aquatic life.

DDE

The available data for DDE indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 1,050 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of DDE to sensitive freshwater aquatic life.

Saltwater Aquatic Life

DDT

For DDT and its metabolites the criterion to protect saltwater aquatic life as derived using the Guidelines is 0.0010 µg/l as a 24-hour average and the concentration should not exceed 0.13 µg/l at any time.

TDE

The available data for TDE indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 3.6 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the

chronic toxicity of DDE to sensitive saltwater aquatic life.

DDE

The available data for DDE indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 14 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of DDE to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of DDT through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-4} , and 10^{-2} . The corresponding criteria are .24 ng/l, .024 ng/l, and .0024 ng/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are .24 ng/l, .024 ng/l, and .0024 ng/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment of an "acceptable" risk level.

Dichlorobenzenes

Freshwater Aquatic Life

The available data for dichlorobenzenes indicate that acute and chronic toxicity to freshwater aquatic life occurs at concentrations as low as 1,120 and 763 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for dichlorobenzenes indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 1,970 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of dichlorobenzenes to sensitive saltwater aquatic life.

Human Health

For the protection of human health from the toxic properties of dichlorobenzenes (all isomers) ingested

through water and contaminated aquatic organisms, the ambient water criterion is determined to be 400 µg/l.

For the protection of human health from the toxic properties of dichlorobenzenes (all isomers) ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 2.8 mg/l.

Dichlorobenzidines

Freshwater Aquatic Life

The data base available for dichlorobenzidines and freshwater organisms is limited to one test on bioconcentration of 3,3'-dichlorobenzidine and no statement can be made concerning acute or chronic toxicity.

Saltwater Aquatic Life

No saltwater organisms have been tested with any dichlorobenzidine and no statement can be made concerning acute or chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of dichlorobenzidine through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-4} , and 10^{-2} . The corresponding criteria are .103 µg/l, .0103 µg/l, and .00103 µg/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are .204 µg/l, .0204 µg/l, and .00204 µg/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Dichloroethylenes

Freshwater Aquatic Life

The available data for dichloroethylenes indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 11,600 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No definitive data are available concerning the chronic toxicity of dichloroethylenes to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for dichloroethylenes indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 224,000 µg, and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity dichloroethylenes to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of 1,1-dichloroethylene through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-4} , and 10^{-2} . The corresponding criteria are .33 µg/l, .033 µg/l, and .0033 µg/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 18.5 µg/l, 1.85 µg/l, and .185 µg/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for 1,2-dichloroethylene.

2,4-Dichlorophenol

Freshwater Aquatic Life

The available data for 2,4-dichlorophenol indicate that acute and chronic toxicity to freshwater aquatic life occurs at concentrations as low as 2,020 and 365 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested. Mortality to early life stages of one species of fish occurs at concentrations as low as 70 µg/l.

Saltwater Aquatic Life

Only one test has been conducted with saltwater organisms on 2,4-dichlorophenol and no statement can be made concerning acute or chronic toxicity.

Human Health

For comparison purposes, two approaches were used to derive criterion levels for 2,4-dichlorophenol.

Based on available toxicity data, for the protection of public health, the derived level is 3.09 mg/l. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 0.3 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Dichloropropanes/Dichloropropenes

Freshwater Aquatic Life

The available data for dichloropropanes indicate that acute and chronic toxicity to freshwater aquatic life occurs at concentrations as low as 23,000 and 5,700 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

The available data for dichloropropenes indicate that acute and chronic toxicity to freshwater aquatic life occurs at concentrations as low as 6,060 and 244 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for dichloropropanes indicate that acute and chronic toxicity to saltwater aquatic life occurs at concentrations as low as 10,300 and 3,040 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

The available data for dichloropropenes indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 790 µg/l, and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of dichloropropenes to sensitive saltwater aquatic life.

Human Health

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for dichloropropanes.

For the protection of human health from the toxic properties of dichloropropenes ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 87 µg/l.

For the protection of human health from the toxic properties of dichloropropenes ingested through contaminated aquatic organisms alone,

the ambient water criterion is determined to be 14.1 mg/l.

2,4-Dimethylphenol

Freshwater Aquatic Life

The available data for 2,4-dimethylphenol indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 2,120 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of dimethylphenol to sensitive freshwater aquatic life.

Saltwater Aquatic Life

No saltwater organisms have been tested with 2,4-dimethylphenol and no statement can be made concerning acute and chronic toxicity.

Human Health

Sufficient data are not available for 2,4-dimethylphenol to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 400 µg/l. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

2,4-Dinitrotoluene

Freshwater Aquatic Life

The available data for 2,4-dinitrotoluene indicate that acute and chronic toxicity to freshwater aquatic life occurs at concentrations as low as 330 and 230 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for 2,4-dinitrotoluenes indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 590 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of 2,4-dinitrotoluenes to sensitive saltwater aquatic life but a decrease in algal cell numbers occurs at concentrations as low as 370 µg/l.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of 2,4-dinitrotoluene through ingestion of contaminated water and contaminated

aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time.

Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 1.1 µg/l, 0.11 µg/l, and 0.011 µg/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 91 µg/l, 9.1 µg/l, and 0.91 µg/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

1,2-Diphenylhydrazine

Freshwater Aquatic Life

The available data for 1,2-diphenylhydrazine indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 270 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of 1,2-diphenylhydrazine to sensitive freshwater aquatic life.

Saltwater Aquatic Life

No saltwater organisms have been tested with 1,2-diphenylhydrazine and no statement can be made concerning acute and chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of 1,2-diphenylhydrazine through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 422 ng/l, 42 ng/l, and 4 ng/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 5.6 µg/l, 0.56 µg/l, and 0.056 µg/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not

represent an Agency judgment on an "acceptable" risk level.

Endosulfan

Freshwater Aquatic Life

For endosulfan the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.058 µg/l as a 24-hour average and the concentration should not exceed 0.22 µg/l at any time.

Saltwater Aquatic Life

For endosulfan the criterion to protect saltwater aquatic life as derived using the Guidelines is 0.0067 µg/l as a 24-hour average and the concentration should not exceed 0.034 µg/l at any time.

Human Health

For the protection of human health from the toxic properties of endosulfan ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 74 µg/l.

For the protection of human health from the toxic properties of endosulfan ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 159 µg/l.

Endrin

Freshwater Aquatic Life

For endrin the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.0023 µg/l as a 24-hour average and the concentration should not exceed 0.18 µg/l at any time.

Saltwater Aquatic Life

For endrin the criterion to protect saltwater aquatic life as derived using the Guidelines is 0.0023 µg/l as a 24-hour average and the concentration should not exceed 0.057 µg/l at any time.

Human Health

The ambient water quality criterion for endrin is recommended to be identical to the existing drinking water standard which is 1 µg/l. Analysis of the toxic effects data resulted in a calculated level which is protective of human health against the ingestion of contaminated water and contaminated aquatic organisms. The calculated value is comparable to the present standard. For this reason a selective criterion based on exposure solely from consumption of 6.5 grams of aquatic organisms was not derived.

Ethylbenzene

Freshwater Aquatic Life

The available data for ethylbenzene indicate that acute toxicity to freshwater

aquatic life occurs at concentrations as low as 32,000 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No definitive data are available concerning the chronic toxicity of ethylbenzene to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for ethylbenzene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 430 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of ethylbenzene to sensitive saltwater aquatic life.

Human Health

For the protection of human health from the toxic properties of ethylbenzene ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 1.4 mg/l.

For the protection of human health from the toxic properties of ethylbenzene ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 3.28 mg/l.

Fluoranthene

Freshwater Aquatic Life

The available data for fluoranthene indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 3980 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of fluoranthene to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for fluoranthene indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations as low as 40 and 16 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Human Health

For the protection of human health from the toxic properties of fluoranthene ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 42 µg/l.

For the protection of human health from the toxic properties of fluoranthene ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 34 µg/l.

Haloethers

Freshwater Aquatic Life

The available data for haloethers indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 360 and 122 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

No saltwater organisms have been tested with any haloether and no statement can be made concerning acute or chronic toxicity.

Human Health

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for haloethers.

Halomethanes

Freshwater Aquatic Life

The available data for halomethanes indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 11,000 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of halomethanes to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for halomethanes indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations as low as 12,000 and 6,400 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested. A decrease in algal cell numbers occurs at concentrations as low as 11,500 µg/l.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of chloromethane, bromomethane, dichloromethane, bromodichloromethane, tribromomethane, dichlorodifluoromethane, trichlorofluoromethane, or combination of these chemicals through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result incremental increase of cancer risk, on the lifetimes are estimated at 10^{-6} , 10^{-7} and 10^{-8} . The corresponding criteria are

1.9 µg/L, 0.19 µg/L, and 0.019 µg/L respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 157 µg/L, 15.7 µg/L, and 1.57 µg/L respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Heptachlor

Freshwater Aquatic Life

For heptachlor the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.0038 µg/l as a 24-hour average and the concentration should not exceed 0.52 µg/l at any time.

Saltwater Aquatic Life

For heptachlor the criterion to protect saltwater aquatic life as derived using the Guidelines is 0.0636 µg/l as a 24-hour average and the concentration should not exceed 0.053 µg/l at any time.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of heptachlor through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-4} , and 10^{-2} . The corresponding criteria are 2.78 ng/L, .28 ng/L, and .028 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 2.85 ng/L, .29 ng/L, and .029 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Hexachlorobutadiene

Freshwater Aquatic Life

The available data for hexachlorobutadiene indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 90 and 9.3 µg/L, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for hexachlorobutadiene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 32 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of hexachlorobutadiene to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of hexachlorobutadiene through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-4} , and 10^{-2} . The corresponding criteria are 4.47 µg/L, 0.45 µg/L, and 0.045 µg/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 500 µg/L, 50 µg/L, and 5 µg/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Hexachlorocyclohexane

Lindane

Freshwater Aquatic Life

For Lindane the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.060 µg/l as a 24-hour average and the concentration should not exceed 2.0 µg/l at any time.

Saltwater Aquatic Life

For saltwater aquatic life the concentration of lindane should not exceed 0.16 µg/l at any time. No data are available concerning the chronic toxicity of lindane to sensitive saltwater aquatic life.

BHC

Freshwater Aquatic Life

The available data for a mixture of isomers of BHC indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 100 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available

concerning the chronic toxicity of a mixture of isomers of BHC to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for a mixture of isomers of BHC indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 0.34 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of a mixture of isomers of BHC to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of alpha-HCH through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-4} , and 10^{-2} . The corresponding criteria are 92 ng/L, 9.2 ng/L, and .92 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 310 ng/L, 31.0 ng/L, and 3.1 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure of beta-HCH through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-4} , and 10^{-2} . The corresponding criteria are 163 ng/L, 16.3 ng/L, and 1.63 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 547 ng/L, 54.7 ng/L, and 5.47 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not

represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure of tech-HCH through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 123 ng/L, 12.3 ng/L, and 1.23 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 414 ng/L, 41.4 ng/L, and 4.14 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure of gamma-HCH through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentrations should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 186 ng/L, 18.6 ng/L, and 1.86 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 625 ng/L, 62.5 ng/L, and 6.25 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for delta-HCH. Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for epsilon-HCH.

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for epsilon-HCH.

Hexachlorocyclopentadiene

Freshwater Aquatic Life

The available data for hexachlorocyclopentadiene indicate that acute and chronic toxicity to freshwater

aquatic life occurs at concentrations as low as 7.0 and 8.2 µg/L, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data to hexachlorocyclopentadiene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 7.0 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of hexachlorocyclopentadiene to sensitive saltwater aquatic life.

Human Health

For comparison purposes, two approaches were used to derive criterion levels for hexachlorocyclopentadiene. Based on available toxicity data, for the protection of public health, the derived level is 206 µg/L. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 1.0 µg/L. It should be recognized that organoleptic data as a basis for establishing a water quality criterion have limitations and have no demonstrated relationship to potential adverse human health effects.

Isophorone

Freshwater Aquatic Life

The available data for isophorone indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 117,000 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of isophorone to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for isophorone indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 12,900 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of isophorone to sensitive saltwater aquatic life.

Human Health

For the protection of human health from the toxic properties of isophorone ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 5.2 mg/L.

For the protection of human health from the toxic properties of isophorone

ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 320 mg/L.

Lead

Freshwater Aquatic Life

For total recoverable lead the criterion (in µg/L) to protect freshwater aquatic life as derived using the Guidelines is the numerical value given by $e^{(2.35[\ln(\text{hardness})] - 9.48)}$ as a 24-hour average and the concentration (in µg/L) should not exceed the numerical value given by $e^{(1.22[\ln(\text{hardness})] - 0.47)}$ at any time. For example, at hardnesses of 50, 100, and 200 mg/L as CaCO₃, the criteria are 0.75, 3.8, and 20 µg/L, respectively, as 24-hour averages, and the concentrations should not exceed 74, 170, and 400 µg/L, respectively, at any time.

Saltwater Aquatic Life

The available data for total recoverable lead indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations as low as 668 and 25 µg/L, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Human Health

The ambient water quality criterion for lead is recommended to be identical to the existing drinking water standard which is 50 µg/L. Analysis of the toxic effects data resulted in a calculated level which is protective to human health against the ingestion of contaminated water and contaminated aquatic organisms. The calculated value is comparable to the present standard. For this reason a selective criterion based on exposure solely from consumption of 8.5 grams of aquatic organisms was not derived.

Mercury

Freshwater Aquatic Life

For total recoverable mercury the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.00057 µg/L as a 24-hour average and the concentration should not exceed 0.0017 µg/L at any time.

Saltwater Aquatic Life

For total recoverable mercury the criterion to protect saltwater aquatic life as derived using the Guidelines is 0.025 µg/L as a 24-hour average and the concentration should not exceed 3.7 µg/L at any time.

Human Health

For the protection of human health from the toxic properties of mercury

ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 144 ng/L.

For the protection of human health from the toxic properties of mercury ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 146 ng/L.

Note.—These values include the consumption of freshwater, estuarine, and marine species.

Naphthalene

Freshwater Aquatic Life

The available data to naphthalene indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 2,300 and 620 µg/L, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for naphthalene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 2,350 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of naphthalene to sensitive saltwater aquatic life.

Human Health

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for naphthalene.

Nickel

Freshwater Aquatic Life

For total recoverable nickel the criterion (in µg/L) to protect freshwater aquatic life as derived using the Guidelines is the numerical value given by $e(0.76[\ln(\text{hardness})] + 1.06)$ as a 24-hour average and the concentration (in µg/L) should not exceed the numerical value given by $e(0.76[\ln(\text{hardness})] + 4.02)$ at any time. For example, at hardnesses of 50, 100, and 200 mg/L as CaCO₃, the criteria are 56, 96, and 160 µg/L, respectively, as 24-hour averages, and the concentrations should not exceed 1,100, 1,800, and 3,100 µg/L, respectively, at any time.

Saltwater Aquatic Life

For total recoverable nickel the criterion to protect saltwater aquatic life as derived using the Guidelines is 7.1 µg/L as a 24-hour average and the concentration should not exceed 140 µg/L at any time.

Human Health

For the protection of human health from the toxic properties of nickel ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 124 µg/L.

For the protection of human health from the toxic properties of nickel ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 100 µg/L.

Nitrobenzene

Freshwater Aquatic Life

The available data for nitrobenzene indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 27,000 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No definitive data are available concerning the chronic toxicity of nitrobenzene to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for nitrobenzene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 8,680 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of nitrobenzene to sensitive saltwater aquatic life.

Human Health

For comparison purposes, two approaches were used to derive criterion levels for nitrobenzene. Based on available toxicity data, for the protection of public health, the derived level is 19.8 mg/L. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 30 µg/L. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have no demonstrated relationship to potential adverse human health effects.

Nitrophenols

Freshwater Aquatic Life

The available data for nitrophenols indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 230 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of nitrophenols to sensitive freshwater aquatic life but toxicity to one species of algae occurs at concentrations as low as 150 µg/L.

Saltwater Aquatic Life

The available data for nitrophenols indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 4,850 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of nitrophenols to sensitive saltwater aquatic life.

Human Health

For the protection of human health from the toxic properties of 2,4-dinitro-cresol ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 13.4 µg/L.

For the protection of human health from the toxic properties of 2,4-dinitro-cresol ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 765 µg/L.

For the protection of human health from the toxic properties of dinitrophenol ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 70 µg/L.

For the protection of human health from the toxic properties of dinitrophenol ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 14.3 mg/L.

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for mononitrophenol.

Using the present guidelines, a satisfactory criterion cannot be derived at this time due to the insufficiency in the available data for tri-nitrophenol.

Nitrosamines

Freshwater Aquatic Life

The available data for nitrosamines indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 5,850 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of nitrosamines to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for nitrosamines indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 3,300,000 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of nitrosamines to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of *n*-nitrosodimethylamine through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 14 ng/L, 1.4 ng/L, and .14 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 180,000 ng/L, 18,000 ng/L, and 1,800 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure of *n*-nitrosodiethylamine through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 8 ng/L, 0.8 ng/L, and 0.08 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 12,400 ng/L, 1,240 ng/L, and 124 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure in *n*-nitrosodibutylamine through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are

64 ng/L, 6.4 ng/L, and .64 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 3,898 ng/L, 387 ng/L, and 38.7 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure in *n*-nitrosodiphenylamine through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 49,000 ng/L, 4,900 ng/L, and 490 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 161,000 ng/L, 16,100 ng/L, and 1,610 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

For the maximum protection of human health from the potential carcinogenic effects due to exposure in *n*-nitrosopyrrolidine through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk, over the lifetimes are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 180 ng/L, 18.0 ng/L, and 1.80 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 919,000 ng/L, 91,900 ng/L, and 9,190 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Pentachlorophenol**Freshwater Aquatic Life**

The available data for pentachlorophenol indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 55 and 3.2 μ g/L, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for pentachlorophenol indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations as low as 53 and 34 μ g/L, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Human Health

For comparison purposes, two approaches were used to derive criterion levels for pentachlorophenol. Based on available toxicity data, for the protection of public health, the derived level is 1.01 mg/L. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 30 μ g/L. It should be recognized that organoleptic data as a basis for establishing a water quality criterion have limitations and have no demonstrated relationship to potential adverse human health effects.

Phenol**Freshwater Aquatic Life**

The available data for phenol indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 10,200 and 2,560 μ g/L, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for phenol indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 5,800 μ g/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of phenol to sensitive saltwater aquatic life.

Human Health

For comparison purposes, two approaches were used to derive criterion levels for phenol. Based on available toxicity data, for the protection of public health, the derived level is 3.5 mg/L. Using available organoleptic data, for controlling

undesirable taste and odor quality of ambient water, the estimated level is 0.3 mg/L. It should be recognized that organoleptic data as a basis for establishing a water quality criterion have limitations and have no demonstrated relationship to potential adverse human health effects.

Phthalate Esters

Freshwater Aquatic Life

The available data for phthalate esters indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 940 and 3 µg/L, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for phthalate esters indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 2944 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of phthalate esters to sensitive saltwater aquatic life but toxicity to one species of algae occurs at concentrations as low as 3.4 µg/L.

Human Health

For the protection of human health from the toxic properties of dimethyl-phthalate ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 313 mg/L.

For the protection of human health from the toxic properties of dimethyl-phthalate ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 2.9 g/L.

For the protection of human health from the toxic properties of diethyl-phthalate ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 350 mg/L.

For the protection of human health from the toxic properties of diethyl-phthalate ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 1.9 g/L.

For the protection of human health from the toxic properties of dibutyl-phthalate ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 34 mg/L.

For the protection of human health from the toxic properties of dibutyl-phthalate ingested through

contaminated aquatic organisms alone, the ambient water criterion is determined to be 154 mg/L.

For the protection of human health from the toxic properties of di-2-ethylhexyl-phthalate ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 15 mg/L.

For the protection of human health from the toxic properties of di-2-ethylhexyl-phthalate ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 50 mg/L.

Polychlorinated Biphenyls

Freshwater Aquatic Life

For polychlorinated biphenyls the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.014 µg/L as a 24-hour average. The available data indicate that acute toxicity to freshwater aquatic life probably will only occur at concentrations above 2.0 µg/L and that the 24-hour average should provide adequate protection against acute toxicity.

Saltwater Aquatic Life

For polychlorinated biphenyls the criterion to protect saltwater aquatic life as derived using the Guidelines is 0.030 µg/L as a 24-hour average. The available data indicate that acute toxicity to saltwater aquatic life probably will only occur at concentrations above 10 µg/L and that the 24-hour average should provide adequate protection against acute toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of PCBs through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 79 ng/L, 0.79 ng/L, and .0079 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 79 ng/L, .079 ng/L, and .0079 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not

represent an Agency judgment on an "acceptable" risk level.

Polynuclear Aromatic Hydrocarbons (PAHs)

Freshwater Aquatic Life

The limited freshwater data base available for polynuclear aromatic hydrocarbons, mostly from short-term bioconcentration studies with two compounds, does not permit a statement concerning acute or chronic toxicity.

Saltwater Aquatic Life

The available data for polynuclear aromatic hydrocarbons indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 300 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of polynuclear aromatic hydrocarbons to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of PAHs through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 28 ng/L, 2.8 ng/L, and 28 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 311 ng/L, 31.1 ng/L, and 3.11 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Selenium

Freshwater Aquatic Life

For total recoverable inorganic selenite the criterion to protect freshwater aquatic life as derived using the Guidelines is 35 µg/L as a 24-hour average and the concentration should not exceed 250 µg/L at any time.

The available data for inorganic selenate indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 760 µg/L and would occur at lower concentrations among species that are more sensitive

than those tested. No data are available concerning the chronic toxicity of inorganic selenate to sensitive freshwater aquatic life.

Saltwater Aquatic Life

For total recoverable inorganic selenite the criterion to protect saltwater aquatic life as derived using the Guidelines is 54 µg/l as a 24-hour average and the concentration should not exceed 410 µg/l at any time.

No data are available concerning the toxicity of inorganic selenate to saltwater aquatic life.

Human Health

The ambient water quality criterion for selenium is recommended to be identical to the existing drinking water standard which is 10 µg/l. Analysis of the toxic effects data resulted in a calculated level which is protective of human health against the ingestion of contaminated water and contaminated aquatic organisms. The calculated value is comparable to the present standard. For this reason a selective criterion based on exposure solely from consumption of 6.5 grams of aquatic organisms was not derived.

Silver

Freshwater Aquatic Life

For freshwater aquatic life the concentration (in µg/l) of total recoverable silver should not exceed the numerical value given by $1.72[\ln(\text{hardness}) - 6.52]$ at any time. For example, at hardnesses of 50, 100, 200 mg/l as CaCO₃, the concentration of total recoverable silver should not exceed 1.2, 4.1, and 13 µg/l, respectively, at any time. The available data indicate that chronic toxicity to freshwater aquatic life may occur at concentrations as low as 0.12 µg/l.

Saltwater Aquatic Life

For saltwater aquatic life the concentration of total recoverable silver should not exceed 2.3 µg/l at any time. No data are available concerning the chronic toxicity of silver to sensitive saltwater aquatic life.

Human Health

The ambient water quality criterion for silver is recommended to be identical to the existing drinking water standard which is 50 µg/l. Analysis of the toxic effects data resulted in a calculated level which is protective of human health against the ingestion of contaminated water and contaminated aquatic organisms. The calculated value is comparable to the present standard. For this reason a selective criterion based on exposure solely from

consumption of 6.5 grams of aquatic organisms was not derived.

Tetrachloroethylene

Freshwater Aquatic Life

The available data for tetrachloroethylene indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 5,380 and 840 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Saltwater Aquatic Life

The available data for tetrachloroethylene indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations low as 10,200 and 450 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of tetrachloroethylene through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time.

Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 8 µg/l, 8 µg/l, and 88 µg/l, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 88.5 µg/l, 8.85 µg/l, and .88 µg/l, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Thallium

Freshwater Aquatic Life

The available data for thallium indicate that acute and chronic toxicity to freshwater aquatic life occur at concentrations as low as 1,400 and 40 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested. Toxicity to one species of fish occurs at concentrations as low as 20 µg/l after 2,600 hours of exposure.

Saltwater Aquatic Life

The available data for thallium indicate that acute toxicity to saltwater

aquatic life occurs at concentrations as low as 2,130 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of thallium to sensitive saltwater aquatic life.

Human Health

For the protection of human health from the toxic properties of thallium ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 13 µg/l.

For the protection of human health from the toxic properties of thallium ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 48 µg/l.

Toluene

Freshwater Aquatic Life

The available data for toluene indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 17,500 µg/l and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of toluene to sensitive freshwater aquatic life.

Saltwater Aquatic Life

The available data for toluene indicate that acute and chronic toxicity to saltwater aquatic life occur at concentrations as low as 6,300 and 5,000 µg/l, respectively, and would occur at lower concentrations among species that are more sensitive than those tested.

Human Health

For the protection of human health from the toxic properties of toluene ingested through water and contaminated aquatic organisms, the ambient water criterion is determined to be 14.3 mg/l.

For the protection of human health from the toxic properties of toluene ingested through contaminated aquatic organisms alone, the ambient water criterion is determined to be 424 mg/l.

Toxaphene

Freshwater Aquatic Life

For toxaphene the criterion to protect freshwater aquatic life as derived using the Guidelines is 0.013 µg/l as a 24-hour average and the concentration should not exceed 1.6 µg/l at any time.

Saltwater Aquatic Life

For saltwater aquatic life the concentration of toxaphene should not exceed 0.070 µg/l at any time. No data

are available concerning the chronic toxicity of toxaphene to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of toxaphene through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 7.1 ng/L, 71 ng/L, and 707 ng/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 7.3 ng/L, 73 ng/L, and 707 ng/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Trichloroethylene

Freshwater Aquatic Life

The available data for trichloroethylene indicate that acute toxicity to freshwater aquatic life occurs at concentrations as low as 45,000 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of trichloroethylene to sensitive freshwater aquatic life but adverse behavioral effects occurs to one species at concentrations as low as 21,900 µg/L.

Saltwater Aquatic Life

The available data for trichloroethylene indicate that acute toxicity to saltwater aquatic life occurs at concentrations as low as 2,000 µg/L and would occur at lower concentrations among species that are more sensitive than those tested. No data are available concerning the chronic toxicity of trichloroethylene to sensitive saltwater aquatic life.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of trichloroethylene through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on

the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 27 µg/L, 270 µg/L, and 2,700 µg/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 807 µg/L, 8,070 µg/L, and 80,700 µg/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Vinyl Chloride

Freshwater Aquatic Life

No freshwater organisms have been tested with vinyl chloride and no statement can be made concerning acute or chronic toxicity.

Saltwater Aquatic Life

No saltwater organisms have been tested with vinyl chloride and no statement can be made concerning acute or chronic toxicity.

Human Health

For the maximum protection of human health from the potential carcinogenic effects due to exposure of vinyl chloride through ingestion of contaminated water and contaminated aquatic organisms, the ambient water concentration should be zero based on the non-threshold assumption for this chemical. However, zero level may not be attainable at the present time. Therefore, the levels which may result in incremental increase of cancer risk over the lifetime are estimated at 10^{-6} , 10^{-5} , and 10^{-4} . The corresponding criteria are 20 µg/L, 200 µg/L, and 2,000 µg/L, respectively. If the above estimates are made for consumption of aquatic organisms only, excluding consumption of water, the levels are 5,246 µg/L, 52,460 µg/L, and 524,600 µg/L, respectively. Other concentrations representing different risk levels may be calculated by use of the Guidelines. The risk estimate range is presented for information purposes and does not represent an Agency judgment on an "acceptable" risk level.

Zinc

Freshwater Aquatic Life

For total recoverable zinc the criterion to protect freshwater aquatic life as derived using the Guidelines is 47 µg/L as a 24-hour average and the concentration (in µg/L) should not

exceed the numerical value given by $610 \text{ in } (100 - \text{hardness})$ at any time. For example, at hardnesses of 80, 100, and 200 mg/L as CaCO₃, the concentration of total recoverable zinc should not exceed 180, 320, and 570 µg/L at any time.

Saltwater Aquatic Life

For total recoverable zinc the criterion to protect saltwater aquatic life as derived using the Guidelines is 58 µg/L as a 24-hour average and the concentration should not exceed 170 µg/L at any time.

Human Health

Sufficient data is not available for zinc to derive a level which would protect against the potential toxicity of this compound. Using available organoleptic data, for controlling undesirable taste and odor quality of ambient water, the estimated level is 5 mg/L. It should be recognized that organoleptic data as a basis for establishing a water quality criteria have limitations and have not demonstrated relationship to potential adverse human health effects.

Appendix B—Guidelines for Deriving Water Quality Criteria for the Protection of Aquatic Life and Its Uses

Introduction

This version of the Guidelines provides clarifications, additional details, and technical and editorial changes in the last version published in the Federal Register [44 FR 15970 (March 15, 1979)]. This version incorporates changes resulting from comments on previous versions and from experience gained during U.S. EPA's use of the previous versions. Future versions of the Guidelines will incorporate new ideas and data as their usefulness is demonstrated.

Criteria may be expressed in several forms. The numerical form is commonly used, but descriptive and procedural forms can be used if numerical criteria are not possible or desirable. The purpose of these Guidelines is to describe an objective, internally consistent and appropriate way of deriving numerical water quality criteria for the protection of the uses of, as well as the presence of, aquatic organisms.

A numerical criterion might be thought of as an estimate of the highest concentration of a substance in water which does not present a significant risk to the aquatic organisms in the water and their uses. Thus the Guidelines are intended to derive criteria which will protect aquatic communities by protecting most of the species and their uses most of the time, but not

DRINKING WATER
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Source:

California State Water Resources
Control Board, 1985,

Interim Guidance for Hazardous Substance
Site Clean-up, CWRCB Resolution No. 85-26

DRINKING WATER STANDARDS AND HEALTH ADVISORIES

CHEMICAL	EPA MCL	EPA RMCL	CA DOHS Action Level	acute 1 day	HEALTH ADVISORIES (SNARLS)		EPA NAHQ non-cancer	EPA NAHQ cancer
					subchronic (no. of days)	chronic non-cancer		
INORGANICS								
Aluminum		\$		3500*	5000(7)*		146	
Antimony		\$						
Arsenic	50						2.2 ppt	
Asbestos		\$					30,000 fibers/l	
Barium	1000			6000*		4700*		
Beryllium		\$					6.8 ppt	
Bromide				1400ppm*	224ppm(7)*	2.3ppm*		
Cadmium	10			150*	21(7)*	5*	10	
Chloramine				1200*	125 (7)*			
Chlorate				125*	125 (7)*			
Chloride	250ppm††		100ppm (CA MCL)					
Chlorine Dioxide				1200*	125 (7)*			
Chlorite				125*	125 (7)*			
Chromium	50						170000(Cr+3) 50(Cr+6)	
Copper	1000††	\$					1000	
Cyanide		\$					200	
Fluoride	1400- 2400							
Iodide				115500	16500(7)*	1190*		

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CHEMICAL	EPA MCL	EPA RHCL	CA DOHS Action Level	HEALTH ADVISORIES (SNARLS)			EPA NAMOC	
				acute 1 day	subchronic (no. of days)	chronic non-cancer	non-cancer	cancer
Iron	300††							
Lead	50						50	
Manganese	50††							
Mercury	2						144 ppt	
Molybdenum		\$						
Nickel		\$					13.4	
Nitrate (as N)	10.0ppm							
Selenium	10						10	
Silver	50						50	
Sodium		\$						
Strontium				8400(7)*				
Sulfate	250ppm†† \$							
Thallium		\$					13	
Uranium						35*		
Vanadium		\$						
Zinc	5000†† \$						5000 (taste/odor)	

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DRINKING WATER STANDARDS AND HEALTH ADVISORIES

CHEMICAL	EPA MCL	EPA RMCL	CA DOHS Action Level	acute 1 day	HEALTH ADVISORIES (SNARLS)		EPA NAHQ non-cancer
					subchronic (no. of days)	chronic non-cancer	
<u>ORGANICS</u>							
Acenaphthene							20 (taste/odor)
Acrolein							320
Acrylamide		\$					
Acrylonitrile					35(10) 3(30)	0.77 *	0.058
Adipates		\$					
Alachlor		\$					
Aldicarb		\$	10			10	
Aldrin			0.05				0.074ppt
Atrazine		\$					
Baygon			90				
Benzene		0	0.70		350(7)	0.67	0.66
Benzene hexachloride (BHC, Lindane)			0.70 (w) 0.30 (p)	3500*	30(7)*	0.35	9.2ppt (w) 16.3ppt (p) 12.3ppt (v) 18.6ppt (d) 0.12ppt
Benzidine							
Benzo(a)pyrene					25(7)		
Bolero(thiobencarb)			10 (1 taste/odor)				
Bromodichloromethane 100**							0.19
Bromomethane (Methyl bromide)							0.19

* 100% trihalomethanes

DRINKING WATER STANDARDS AND HEALTH ADVISORIES

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CHEMICAL	EPA MCL	EPA RMCL	CA DOHS Action Level	HEALTH ADVISORIES (SNARLS)			EPA NAHOC	
				acute 1 day	subchronic (no. of days)	chronic non-cancer	non-cancer	cancer
Captan			350					
Carbofuran		\$						
Carbon tetrachloride		0	5.0	200†	20(10)†			0.40
Catechol				2200*				
Chlordane		\$	55	63	8(10)	0.023		0.46ppt
Chlorobenzene						72	4.7*	400 (20 tasteodor)
bis-(2-chloroethyl) ether								0.03
Chloroform (trichloromethane)	100**			2200*	3200(7)*			0.19
bis-(2-chloroisopropyl) ether							34.7	
Chloromethane (Methyl chloride)								0.19
bis-(chloromethyl) ether								0.0038 ppt
2-Chlorophenol							0.1(tasteodor)	
3-Chlorophenol							0.1(tasteodor)	
4-Chlorophenol							0.1(tasteodor)	
CIPC			350					
Dalapon		\$						
DDT				1				0.024ppt
Diazinon			14					
Dibromochloromethane	100**			18000*				0.19

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CHEMICAL	EPA MCL	EPA RMCL	CA DOHS Action Level	HEALTH ADVISORIES (SNARLS)			EPA NAWQC
				acute 1 day	subchronic (no. of days)	chronic non-cancer	
1,2-Dibromo-3-chloro- propane (DBCP)		\$	1.0			0.050	0.01
1,2-Dibromomethane (Ethylene Dibromide)		\$	LOQ(0.05)				0.67ppt
Di-n-butyl phthalate							34000
1,2-Dichlorobenzene			130** (10 tasteodor)			300	400
1,3-Dichlorobenzene			130** (20 tasteodor)				400
1,4-Dichlorobenzene		750	130** (0.3 tasteodor)			130	400
Dichlorobenzidine							0.0103
Dichlorodifluoromethane							0.19
1,2-Dichloroethane		0	1.0				0.6†
1,1-Dichloroethylene		0	LOQ(.1-.4)	1000†		70†	0.24
cis-1,2-Dichloro- ethylene				4000†	400(10)†		
trans-1,2-Dichloro- ethylene				2700†	270(10)†		
Dichlorofluoromethane (Freon 21)				100ppm	43ppm(7)	1.6ppm	
Dichloromethane							0.19
2,3-Dichlorophenol							0.04(tasteodor)
2,4-Dichlorophenol						700*	
2,5-Dichlorophenol							0.5(tasteodor)
2,6-Dichlorophenol							0.2(tasteodor)
3,4-Dichlorophenol							0.3(tasteodor)

**Action level is for a single isomer or sum of the three

DRINKING WATER STANDARDS AND HEALTH ADVISORIES

CHEMICAL	EPA MCL	EPA RMCL	CA DOHS Action Level	HEALTH ADVISORIES (SHARLS)			EPA NAWQC	
				acute 1 day	subchronic (no. of days)	chronic non-cancer	non-cancer	cancer
2,4-Dichlorophenoxy- acetic acid (2,4-D)								
1,2-Dichloropropane		\$	10					
Dichloropropene							87	
Dieldrin			LOQ (.05)					0.07 ppt
Di-(2-ethylhexyl) phthalate or DEHP						210	15000	
Diethyl phthalate							350000	
Dimethoate			140					
2,4-dimethylphenol			400 (taste&odor)					
Dimethylphthalate							313000	
2,4-Dinitro-o-cresol							13.4	
2,4-Dinitrophenol						110*		
2,4-Dinitrotoluene								0.11
Dinoseb (2-sec-Butyl- 4,6-dinitrophenol)		\$				39*		
1,4-Dioxane					20 (10)			
Diphenamide			40					
1,2-Diphenylhydrazine								0.042
Diquat		\$		1				
Endosulfan							74	
Endothall		\$						

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CHEMICAL	EPA MCL	EPA RMCL	CA DOHS Action Level	HEALTH ADVISORIES (SHAELS)			EPA HAHQ non-cancer
				acute 1 day	subchronic (no. of days)	chronic non-cancer	
Endrin	0.2						
Epichlorohydrin		\$		840*	530(7)*		
Ethion			35				
Ethylbenzene							1400
Ethylene dibromide (EDB)		\$	LOQ(.05)			0.67ppt	
Ethylene glycol				19000†		5500†	
Fluoranthene							42
Formaldehyde			30	30**			
Glyphosate		\$	500				0.28
Heptachlor			0.02				
Heptachlor epoxide			0.10				
Hexachlorobenzene*					30(7)*	0.35	0.54*
Hexachlorobutadiene							0.45
Hexachlorocyclo- pentadiene		\$					206
Hexachlorophene						0.35	1.0 (taste & odor)
n-Hexane				12900†	4000(10)†		
Isophorone							5200
Isopropyl alcohol (Isopropanol)				1000	1000(10)		
Lindane (gamma-BHC)	4						12.3ppt

DRINKING WATER STANDARDS AND HEALTH ADVISORIES

CHEMICAL	EPA MCL	EPA RMCL	CA DOHS Action Level	HEALTH ADVISORIES (SNARLS)		EPA NAWQC non-cancer
				acute 1 day	subchronic (no. of days)	
Pentachlorobenzene						74
Pentachlorophenol		\$	30			
Picloram		\$			1050*	
Phenol			1.0			3500 300 (tastes odor)
Phthalates		\$				
Polychlorinated biphenyls (PCB)		\$		125	12.5 (10) 1 (30)	0.3 0.7 ppt
Polynuclear Aromatic Hydrocarbons		\$				2.8 ppt
Resorcinol				11700*	500*	
Rotenone					14*	
Simazine		\$				
Styrene					1300	
Terrachlor (pentachloronitrobenzene)			0.9			
1,2,4,5-Tetrachloro- benzene						38
2,3,7,8-Tetrachloro- dibenzo-p-dioxin		\$				1.3x10 ⁻¹
1,1,2,2-Tetrachloro- ethane						0.17
Tetrachloroethylene		0	4.0	2300	175 (10)	0.8
2,3,4,6-Tetrachloro- phenol				1		1 (tastes odor)
Toluene		\$	100	1000	1000 (10)	14300
Toxaphene	5					0.71 ppt

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CHEMICAL	EPA MCL	EPA RMCL	CA DOHS Action Level	HEALTH ADVISORIES (SVARLS)			EPA N ^o CC NON-CANCER	EPA N ^o CC CANCER
				acute 1 day	subchronic (no. of days)	chronic non-cancer		
Malathion			160					
Methomyl (Lannate)						175*		
Methoxychlor	100							
2-methyl-4-chloro- phenol							1800 (tasteodor)	
3-methyl-4-chloro- phenol							3000 (tasteodor)	
3-methyl-6-chloro- phenol							20 (tasteodor)	
Methylene chloride			40	13000†	1300-1500(10)†	150†		
Methyl ethyl ketone				7500†	750(10)†			
Methyl methacrylate						35		
Methyl Parathion			30					
Mononitrophenol					290(7)*			
Nitrobenzene				35*	5(7)*		19800 30 (tasteodor)	6.4 ppt
n-Nitrosodi-n-butyl- amine								0.8 ppt
n-Nitrosodiethlyamine								1.4 ppt
n-Nitrosodimethylamine								4.9
n-Nitrosodiphenylamine								16.0 ppt
n-Nitrosopyrrolidine				1				
Ordram (Molinate)			20					
Parathion			30					

DRINKING WATER STANDARDS AND HEALTH ADVISORIES

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CHEMICAL	EPA MCL	EPA RMCL	CA DOHS Action Level	HEALTH ADVISORIES (SNARLS)			EPA NAHQ	
				acute 1 day	subchronic (no. of days)	chronic non-cancer	non-cancer	cancer
Tribromomethane (Bromoform)	100**							0.19
1,1,1-Trichloroethane		200	200	140000	20000(10)	1000	18400	
1,1,2-Trichloroethane		5						0.6
Trichloroethylene		0	5.0	2000	200(10)	75		2.7
Trichlorofluoromethane (Freon 11)				25000	2200(10)			0.19
2,4,5-Trichlorophenol							2600	
2,4,6-Trichlorophenol				17500*	2500(7)*		1(taste&odor)	1.2
2,4,5-Trichloro- phenoxypropionic acid (2,4,5-TP Silvex)	10							
2,4,6-Trinitrophenol				4900*	20(7)*		2(taste&odor)	
Trithion			7.0					
Vinyl chloride		0	2.0					2.0
Vydate		5						
Xylenes***		5	620	12000†	1400(10)†	620†		
m-Xylene			620	6100	3200(10)			
p-Xylene			620					
o-Xylene			620					

END
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